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A SOCIO-TECHNICAL ANALYSIS OF COMPUTER APPLICATION WITHIN THE FOURTH MARINE AIRCRAFT WING

by

R. Paul Ortiz

and

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March 1987

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A Socio-Technical Analysis of Computer Application within the Fourth Marine Aircraft Wing

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The acquisition of microcomputers within the Fourth Marine Aircraft Wing (4TH MAW) has placed a major emphasis on the computerization of the already existing information systems. The Information Sytems Management Office within the 4th MAW has been restructured and is presently forcing key personnel to re-think and analyze the role of information processing. This thesis addresses the socio technical approach to the technology transfer and office automation processes within the 4th MAW. The role of the Zenith 150 microcomputer is examined for its effectiveness and ability to improve the units´ responsiveness to operational tasks. The Zenith 150 microcomputer is an effective tool which can assist management in planning, problem solving, communication and decision making.

The authors´ research findings indicate that the implementation process currently being used is not sufficient to meet all the needs of 4th MAW units. This study identifies alternatives necessary to meet user needs. A socio-technical framework is applied to discuss the use of integrating mechanisms such as local area networks (LAN´s), modems, data base programs, and quality training schedules. The authors´ process, which implements these devices, will provide better unit communication and enhance operational efficiency.

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I. INTRODUCTION

A. GENERAL

Until recently, only large corporations and specialized agencies within the Department of Defense could afford to purchase and maintain computer systems. Modern computer technology expanded and the development of the small semi-conductor, integrated chip made possible the mass production of microprocessors. Microcomputer prices started to decrease and their capabilities started to increase. Through technological development the microcomputer has become common place. Even though, technology was available for over a decade the Marine Corps units received their first tactical microcomputer in 1980. The tactical microcomputer Green Machine built by IBM, used 8 inch disk drives, 64K of memory and had a limited selection of usable software. In recent years the Green Machine has been modified to 128K of memory to include an extensive software selection. The Automated Data Processing Equipment Fleet Marine Force (ADPE-FMF) program will be updated by the "Fleet Marine Force End User Computing Equipment (FMF EUCE)" program. The FMF EUCE program is a direct outgrowth of the ADPE-FMF program. Even with recent upgrades and modifications, the Green Machine is now technologically obsolete. The developing automated information systems and the commercial software industry have gone far beyond the device´s capability and original intent. The FMF EUCE computer will be fully hardware and software compatible with the Navy and Air Force Zenith-248 microcomputer and the IBM PC/AT. The FMF EUCE central processing unit (CPU) component will be an 80286 processor with a capacity of up to 16 MB (million bytes of memory). It will include 2MB of dynamic Randon Access Memory (RAM), a floppy disk drive and a removable hard disk drive. These advancements are a tremendous improvement over the Green Machine.

The hardware and software procurement lag associated with the military actually helped in obtaining a better computer. As computer technology improved the Marine Corps funded the acquisition of micros for all tactical units. This later included units of the 4th MAW. The 4th MAW purchased the Zenith 150 microcomputer. All 25 sites throughout the geographical United States received the Zenith 150 microcomputer and three commercial "off the shelf" software packages to support their administration, supply and maintenance requirements. The tremendous influx of microcomputers has changed and will continue to change the management of information. This growth has left many managers without a corporate knowledge base. The phrase: "But that´s how we have always done it" will no longer pertain, at least until the next generation of managers emerge.

With proper integration a system of hardware, software, and personnel will have many benefits. Improved productivity and enhanced operational readiness is only the beginning.

B. PURPOSE

The focus of this research is upon the present office automation environment and technical transfer development of the 4th MAW. The desired result of this research is to provide management with tools and suggestions to make the office environment productive, efficient and effective.

Today many military personnel are faced with the use of microcomputers. They must be able to effectively adapt to the powerful capacity that is now available to them. Additionally, they must have the expertise to resolve the real life crisis of quickly and effectively grasping and implementing this knowledge to achieve accurate, precise and usable results for mission accomplishment.

C. SCOPE OF THE THESIS

The overall objective is to analyze the level of socio technical interface reached by the 4th MAW since the introduction of office technology. A determination will be made whether or not alternative methods should be introduced to bridge the man-machine interface gap and exploit this modern technology. The 4th MAW was selected because of its cross sectional staffing of regulars and reservists, dispersed geographically in 25 sites through out the continental U.S.. This reference group is rich in technological experience from both the military and civilian sectors and will provide best case data for the diagnosis and alignment procedures required in a case study. This optimum data, collected from a select cross section of the organization, could be construed as an unrealistic, narrow view of the socio-technical problem facing the Marine Corps as a whole. This approach may limit the relevancy of the recommendations to other than the target group.

D. METHODOLOGY

Survey questionaire, interview, observation and personal experience will be incorporated to glean the pertinent data from key organizations in the 4th MAW hierarchy. The information systems officer(ISMO) and the four major departments (S-1, S-2, S-3, S-4 and Maintenance) from each site will receive a Modern Office Technology Survey. Select sites will be visited in an attempt to synergize observation and personal experience to formulate a diagnostic technique for evaluation of the socio-technical impact caused by modern office technology. The technical, political and cultural subsystems will be separated to show their particular effect on technology transfer. An assessment will be made as to the efficiency, productivity and effectiveness of the present environment. Recommendations for alignment of these systems to include possible alternatives for optimization of technology use at USMCR sites will be proposed.

II. FOURTH MARINE AIRCRAFT WING

A. INTRODUCTION

The Fourth Marine Aircraft Wing is a unique blend of part-time and active duty, full-time marines. The tactical mission of the 4th MAW is essentially the same as the other three Marine Aircraft Wings even though its manpower is derived from approximately 75% part-time marines and 25% full time marines. Secondly, 4th MAW´s 25 sites are located through out the continental United States. Finally, the vast amount of tactical training and operational preparation occurs frequently during weekend drill periods. The Wing configuration remains a flexible organization which is capable of manning Marine Amphibious Units, Marine Amphibious Brigades and other unique configurations as required. It can virtually integrate with all types of aircraft, personnel and other forces in a concerted effort against volatile situations.

B. BACKGROUND

The Marine Corps Aviation mission in recent years has remained fundamentally unchanged. However, the necessity for using computers and word processing devices for the effective management of men, money, supplies and equipment to support this mission is rapidly becoming apparent in the 4th MAW. Figure 2.1 illustrates the rapidity and the magnitude of the technological changes that have occurred in data processing in recent years:

I PROCESSOR SPEEDS (multiplications per second)

1952	2,200
1964	12,000
1980	240,000

II PROCESSOR MEMORY CAPACITY (in bytes)

1960	32,000, 64,000, 128,000
1980	millions

III PROCESSOR MEMORY COSTS (monthly per million bytes)

1952	$222,000
1964	$28,000
1980	$430

Figure 2.1 Technological Comparsion [Ref.1]

In early 1980 the Marine Corps received the IBM Model 4110, ADPE-FMF GREEN MACHINE computer. During the early phases, the Green Machine was used for administration and supply. It later became supersaturated with user demands. The main reason for this situation is that the Green Machine did not have sufficient built-in storage and processing capacity to accomplish today´s increasing volume of user requirements without using an extremely large quantity of floppy diskettes. Computer communication with other departments or units was difficult to implement. Presently the IBM Model 4110 Display Processor Unit (DPU) has 2 million byte mass storage with two diskettes and a nine inch Cathrode Ray Tube (CRT). The IBM 4110 is accompanied with an IBM 4974 matrix printer unit that is bi-directional and prints at 120 characters per second. This combination is portable and ruggedized so that it can be transportable by any organic method. Both assets in transport casing weight 121 lbs and 118 lbs respectively. The present methodologies used to transport data/diskettes generated by the ADPE-FMF computer are by mail, and by the use of the Automated Service Centers (ASC) via the Marine Corps Data Network (MCDN)[Figure 2.2].

The computer replacement for the Green Machine is the FMF EUCE package. The FMF EUCE device will be a ruggedized, desktop, tempest accredited microcomputer (tempest approved ensures that electromagnetic eminants are minimized and protected from unauthorized analysis). The FMF EUCE will not only replace the ADPE-FMF but will support the implementation of the new developing Automated Information System´s such as Real FAMMIS, MIS and SABRS. The FMF EUCE will be fully hardware and software compatible with the Zenith and IBM PC/AT´s. The processor will have a capacity of up to 16 MB (million bytes of memory), 2MB of dynamic RAM, a floppy disk and a removable hard disk drive.[Ref. 2]

The FMF EUCE will be supported by a dot matrix printer which prints 150 characters per second (CPS). Additionally, software included will the Micro-Soft Disk Operating System (MS-DOS) of 3.1 or later version, a hard disk drive back-up

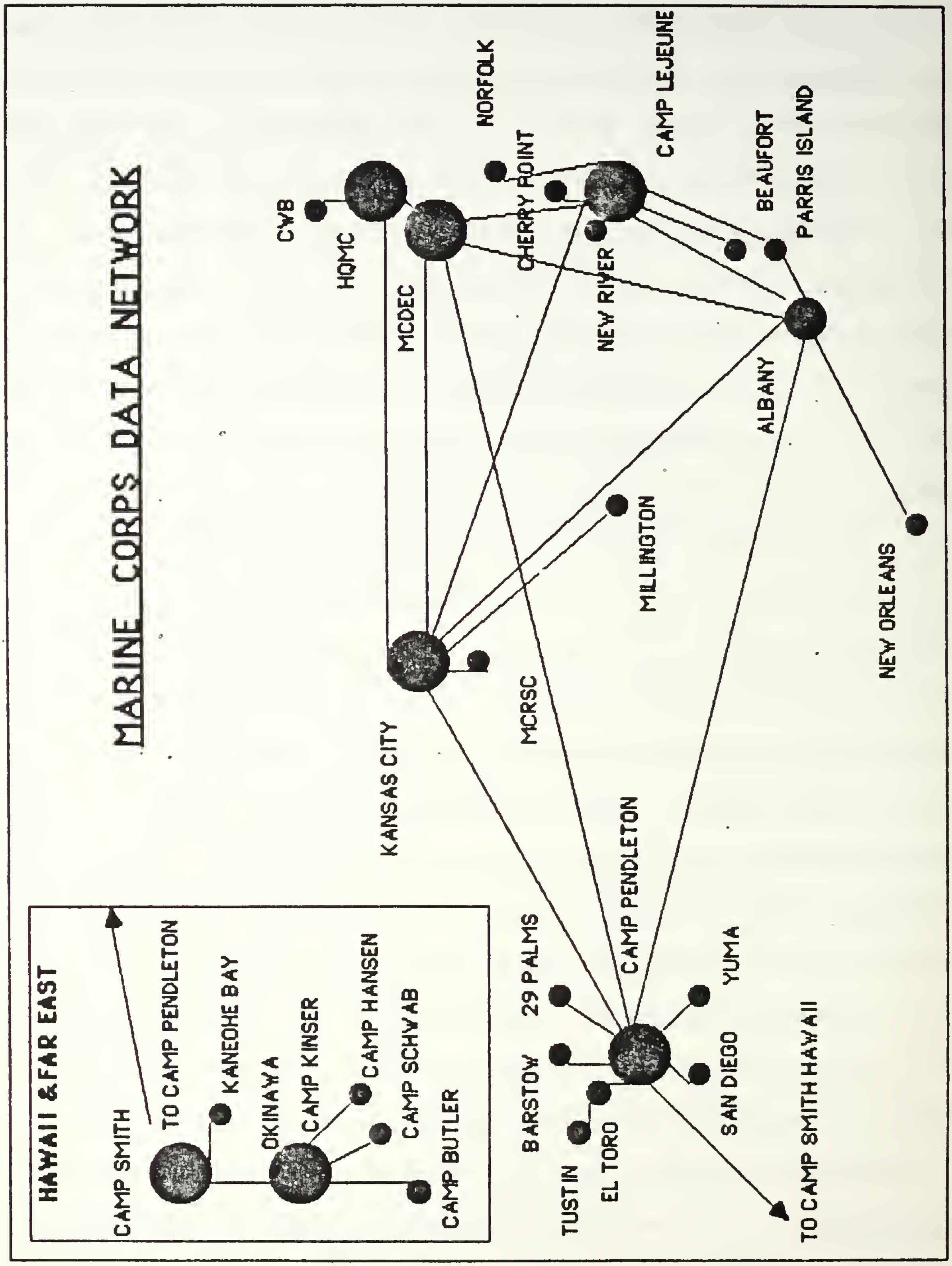

MARINE CORPS DATA NETWORK
CWB
HQMC
MCDEC
NORFOLK
CHERRY POINT
CAMP LEJEUNE
NEW RIVER
BEAUFORT
PARRIS ISLAND
ALBANY
MILLINGTON
NEW ORLEANS
KANSAS CITY
MCRSC
CAMP PENDLETON
29 PALMS
YUMA
BARSTOW
SAN DIEGO
TUSTIN
EL TORO
TO CAMP SMITH HAWAII
HAWAII & FAR EAST
CAMP SMITH
TO CAMP PENDLETON
KANEOHE BAY
OKINAWA
CAMP KINSER
CAMP HANSEN
CAMP SCHWAB
CAMP BUTLER

Figure 2.2 Marine Corps Data Network

and systems diagnostics, which will isolate malfunctions in the electronic circuitry and mechanical components of the system.

During fiscal year 1985 the 4th MAW purchased numerous Zenith 150 (IBM compatible) microcomputers with distribution to all 25 sites: Figure 2.3 illustrates the organizational structure and physical location of each site within the 4th MAW organization.

The 4th MAW is expected to quickly move into the area of office information systems with its present Zenith 150 systems and future purchase of a IBM compatible, ruggedized FMF EUCE microcomputer.

Presently, the Zenith 150 microcomputer is mainly being used for word processing tasks and is not nearly used to the capacity in which it was designed to perform. This dilemma is not unique to the 4th MAW but statistically to the general computer environment as well. It appears that one out of five micros in the government is unused or underused [Ref. 3].

Managing involves analysis of the electronic data processing (EDP) evolution which involves strategic planning. Richard L. Nolan postulated a model of EDP, which includes six stages of computer technology development [Ref.4]. These stages begin with initiation and run through contagion, control, integration, data

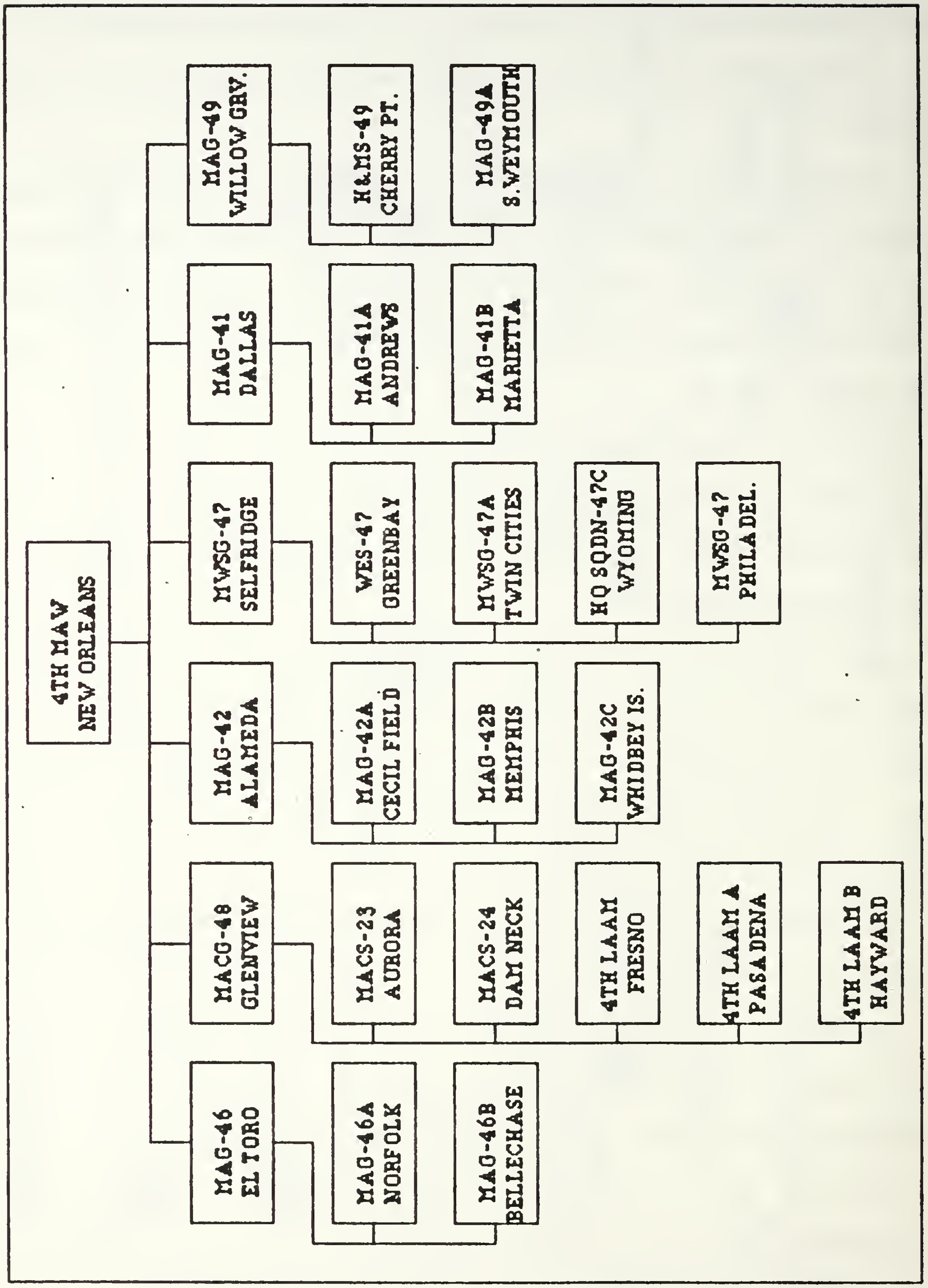

4TH MAW NEW ORLEANS
MAG-46 EL TORO
MAG-46A NORFOLK
MAG-46B BELLECHASE
MACG-48 GLENVIEW
MACS-23 AURORA
MACS-24 DAM NECK
4TH LAAM FRESNO
4TH LAAM A PASADENA
4TH LAAM B HAYWARD
MAG-42 ALAMEDA
MAG-42A CECIL FIELD
MAG-42B MEMPHIS
MAG-42C WHIDBEY IS.
MWSG-47 SELFRIDGE
WES-47 GREENBAY
MWSG-47A TWIN CITIES
HQ SQDN-47C WYOMING
MWSG-47 PHILADEL.
MAG-41 DALLAS
MAG-41A ANDREWS
MAG-41B MARIETTA
MAG-49 WILLOW GRV.
H&MS-49 CHERRY PT.
MAG-49A S.WEYMOUTH

Figure 2.3 4th MAW Organization Structure by Site management/administration and maturity. The graph in Figure 2.4 shows the orientation between the management of hardware and data. This is a graphic tool which can aid in determining the unit´s location within the standard EDP evolution. The length and development of the individual stages can be tracked with regard to cost efficiency or personnel or system specifications. As a planning tool the parameters can be varied or the slope of the curve can be changed be implementing controls at earlier or later stages. This will enable management to tailor the process to the individual unit´s unique requirements.

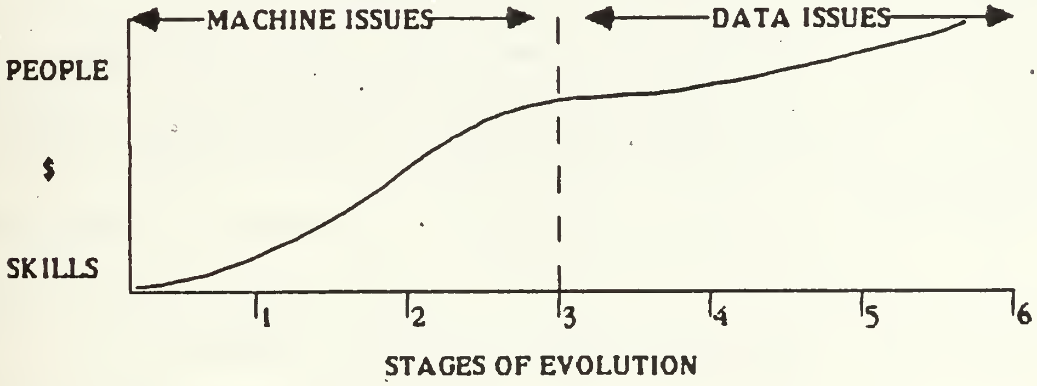


Figure 2.4 Nolan´s EDP Evolution

The 4th MAW is presently experiencing the expansion - consolidation stage of Nolan´s model. During this stage periods of expansion followed by periods of conflict occur as the users and managers are euphoric about the possibilities of computer applications. Marines can at times be disenchanted with the uncontrolled environment and unmet expectations of information systems. Many users were enthusiastic about the future of the computer and its application toward their mission in the 4th MAW. This positive user attitude enhanced by well planned implementation can contribute significantly to efficient office automation and effective technology transfer applications.

> Ideas confine a man to certain social groups and social groups confine a man to certain ideas. Many ideas are more easily changed by aiming at a group than by aiming at an individual
>
> Josephine Klein [Ref.5]

The 4th MAW office of information systems is on the right track of harnessing this energy and enthusiasm and using it to improve unit operational effectiveness via the microcomputer.

III. INFORMATION SYSTEMS WITHIN THE 4TH MAW

A. OFFICE AUTOMATION

Information work has become the dominant economic activity in the United States [Ref. 6]. The Bureau of Labor Statistics has recently changed its occupational definition from the "white-collar worker" category to the "information worker" category. The rapidly decreasing cost of computers and computer communications combined with development in computer software to support what Peter Drucker calls "knowledge workers" make the microcomputer a good candidate for increasing productivity in any environment involving information processing and decision making. The placement of more than 200 million electronic workstations in offices world wide is forecast by the turn of the century.[Ref 6] To keep in step with this proliferation of technology the 4th MAW is planning for at least 4 micro computers per squadron/battalion size unit.

Currently, well over half of all workers in this country are in positions of management, administrative support, and on professional staffs where information processing accounts for the largest portion of their work related time [Ref.6]. Although this figure is not indicative of the tactical/support personnel mix in the 4th MAW, more than half of the organization´s major tasks involve some type of information processing. An ever increasing proportion of the total cost of doing business is due to these information work activities.

The fastest growing application of technology to information work activities is that of office automation (OA), which is the placement of interactive computer tools in the hands of individual knowledge workers at their desks and in the areas in which they are physically working [Ref.7]. Interactive implies: (1) that the computer tools are available whenever the knowledge workers want to use them; (2) that workers can communicate with the computer and make decisions about what they want the machine to do next based on current results; and (3) that they will get an immediate response from the computer. Because the commodity they deal in is information, these computers need to be highly interactive. They also need to function as user friendly extensions to an individual´s thought processes. These tools should help individuals perform the major tasks of planning, programming, budgeting, coordinating, monitoring, policy formulation, decision making and directing. These processes are instrumental in the production of strategic plans, budgets and other products that are necessary for the organization to function properly. This will in turn improve the overall productivity of the organization and of the individual within it.

New technology facilitates the marriage of word processing and office automation to telecommunications. Designers of word processor equipment can now include in work stations the ability to communicate to other work stations as well as to central storage devices through telecommunication systems. These features permit word processors to emerge, not only as automated typwriters, but as the basic building block of an automated office. [Ref.8]

OA systems are applicable to three principal work activities: Document production, which is dependent upon the word processing and graphics capabilities of the hardware and software being utilized; Information processing for Management Information (MIS) and Decision Support (DSS) Systems which require the use of data base management software; and communications, like electronic mail. All three of these activities require personnel trained in procedures and equipment use. OA systems may address different combinations of these activities depending on the particular office tasks to be accomplished. To allow for interaction between these processes, the installation of integrating mechanisms such as modems and local area networks (LANS) is required. There are costs and benefits to be weighed but if the inherent capabilities of OA systems are to be exploited these types of application hardware must be considered.

Improving office productivity through the use of OA is generally expensive. A typical OA system represents a significant initial and recurring expense to an organization. This expense is justified if the value of the benefit exceeds the costs to achieve it. (Including the cost of designing, installing and operating the OA systems.) These benefits may be realized in any of the following ways: A reduction in personnel or materials cost; an ability to handle an increased workload with little or no increase in personnel costs; and improved mission performance through improved quality of support products and services. The productivity of information workers has appeared to remain relatively flat in contrast to industrial workers whose productivity has been shown to grow with the introduction of automation [Ref.9]. This can be attributed to the under capitalization of the socio-technical resources available. Numerous studies, reports and articles have agreed that the use of a variety of computer and communication technologies could contribute to the efficient and cost-effective preparation, distribution, storage and retrieving of data for management information, decision support, inventory control and general office systems. Up to now, the general experience with OA has been primarily the implementation and usage of word processing systems resulting in only a limited usage of the capacities available.

Much of the computer applications found in business and in the military depend on telecommunications media for their success. The rapid improvement and change in communication technology brought on by satellites and fiber optics has provided low cost alternatives for OA which just did not exist ten years ago. There is considerable skill involved in selecting the systems available for integrated OA because of the fine distinction between computer, communications, and software options. A large part of the advance in the communications technology was bought about by the introduction of digital technology into the telephone company plants. More and more of the business of these plants is becoming digital in nature with the analog voice traffic being carried in basically digital form. Most telephone systems have been installed and are being installed with backup and additional twisted pair or coaxial cables for future connection of microcomputers to local area networks at no extra cost.

The Private Branch Exchange (PBX) is now able to handle a variety of different speeds and characteristics. Other channels include voice, FAX, graphics and data. Local communications can however be handled more efficiently using an all digital system, like a broadband distributed ring.

Depending on transmission media and protocols used the cost is very competitive.

The 4th MAW will soon have more and better computers, more reliable, more secure and more powerful. How can we capitalize on this capability? There are a number of options. We have the use of this hardware in traditional centralized timesharing systems and the newly acquired stand alone Zenith 150. Besides word processing there are not many things that a marine really can do with a computer if he only has his data and his own limited capabilities. He wants to access others' data and programs, interchange documents, messages, etc. and be able to make decisions using this real time information as a knowledge base. He would like an interconnected set of intelligent systems each personalized to the individual user. Such a progression of thinking rapidly leads to systems that are distributed in nature and that form the central core of office automation.

A pertinent case study conducted by the House Committee on Rules and Administration to identify potential applications for OA and to rank them in order of usefulness and cost effectiveness. Senate offices were selected to participate in this study based on prior interest in the use of OA and the support of the affected senator and his administrative assistant. Prior experience with office automation equipment was not a criterion. Twelve senate offices were equipped with systems that ranged from electronic typewriters to fullscale computer networks. A basic requirement of the test was to distinguish between those applications that would be useful to all users in their day to day work and those that would fall into disuse after their "fad factor" wore off [Ref.10]. This strategy would eventually reduce the costs of proliferation in what Richard L. Nolan calls the contagion stage or stage 2 in his model which outlines the six stages of growth in an organizations´ data processing function. The types of applications such as word processing, spreadsheets, automated scheduling, electronics communication, and data base record keeping are similar to those which will eventually be employed by the 4th MAW as its technology advances and as more funding is made available.

The test evaluation was conducted by a liaison team consisting of representitives from the Senate Computer Center, Educational Services and Support Division and the technical services staff of the Committee on Rules and Administration. [Ref. 10] Weekly visits were made to give the offices and opportunity to share any complaints or favorable comments they had about the test and, more importantly, to allow observation of the various users reactions to the introduction of OA. With respect to the hardware and software placed in each office by various vendors, the liaison team refrained from offering advice, suggestions, or technical information, so as not to interfere with the real focus of the test--that being to evaluate how the users themselves would learn the OA techniques and apply them to the information work activities of their respective offices.

The findings are relative to the type of information solicited on the Modern Office Technology Survey. All the offices quickly learned word processing and were able to use it to produce letters, speeches, press releases and floor statements.[Ref. 10] In some offices, the OA equipment was used exclusively by the secretarial staff. In others, the professional staff soon adopted it for their daily use, and found a major benefit of OA to be the enhancement of their creative powers at the time of initial document composition [Ref.11]. In only a few instances was OA tried and rejected by professional staff and members.

While electronic spreadsheets may eventually prove useful to the Senate staffs, the results of the pilot test were inconclusive. This was attributable to two factors: (1) the greater complexity and subtlety of using spreadsheet applications programs in comparison with using most word processing programs, and (2) the comparatively far greater requirement of most staff members to produce textual material versus conducting complex numerical analysis.[Ref. 10] In general, a very small proportion of the staffs saw enough relevance of the electronic spreadsheet to their work to invest the time necessary to gain proficiency in its use.

This may be the case with SuperCalc the standard issued spreadsheet program in the 4th MAW.

A few of the offices used the test systems to automate the management and publishing of their office schedules. One office, Senator Kennedy´s, used the schedule feature extensively and judged it to be their most useful OA feature [Ref.10]. As the schedule changed, they updated the electronic file containing the schedule and produced updated copies of the Senator´s schedule.

The operations officer and commanding officer (CO) in an aviation squadron spend the better part of each day conferring with maintenance control and the various department heads to gather enough information to formulate operational plans and produce the daily flight schedule. Events continually change and writing the schedule is a fulltime job for an operations officer and his administrative assistants. In many cases the volatile operating environment is more conducive to word of mouth schedules based on non-confirmed data which result in continual rewrites of the proposed final draft. This situation may drag on until aircrew are not able to make commitments for the following day´s administrative workloads. The ability for all departments having input to the schedule to update an electronic file in real time and allow continual monitoring and review, by the C.O. and operations officer would reduce errors and increase the efficiency and effectiveness of squadron operations.

A number of the staffs recognized at the very beginning of the test that communications among terminals within the Senator´s Washington office and the various state offices was highly desirable. The test supported this view [Ref.10]. Other offices which were provided with stand alone micro computers, where communications were not available, eventually found the lack of these communications capabilities quite frustrating. The consensus among all test participants was that any future Senate wide OA system should include a communications capability and that it should be able to support centralized staff schedule management, office message switching, transfer of draft documents from one worker to another and transmission of material between the Washington and state offices.

The acquisition and use of modems will give the geographically dispersed units of the 4th MAW the ability, to communicate between each other´s micro terminals. The installation of a LAN among micros within some organizations will support the real time message switching capability which is a key factor in the automated office. Stand alone Zenith 150 micro computers lack the interactive features which will enable each unit to perform its major decision making activities in an effective cost efficient manner. Stand alone computers are isolated components of a much larger system of people and integrating devices which only taken as a whole can be called office automation.

B. TECHNOLOGY TRANSFER

> If every human group had been left to climb upward by its own unaided efforts, progress would have been so slow that it is doubtful whether any society by now could have advanced beyond the level of the Old Stone Age.
>
> Ralph Linton [1936]

1. Definition of Technology Transfer

Technology Transfer (TT) is defined by Everett M. Rodgers as a process by which existing knowledge is transfered operationally into usable software programs that accomplish actual needs (Note Figures 3.1 and 3.2). [Ref. 12]

```
 Source of     Transfer Mechanism          Utilization
 knowledge ----------------------------->  of knowledge
(supplier)                                (user/receiver)
```

Figure 3.1 A Simple Technology Transfer Model

```
Current state   ------->T.T. & application    New state
of technical                  design          of technical
knowledge       ------->Innovation, comm      knowledge
                        technology to satisfy
                        a demand
                ------->motivation & adoption
                        of an innovation
```

Figure 3.2 Developed Technology Transfer Model [Ref.12]

2. Technology Transfer and the Marine

The factors which determine the individual marine´s ability and willingness to develope and utilize technolgy transfer must also be considered and are summarized below:

* training and experience
* communication internal/external
* organization effects
* mission orientation
* motivation

a. Training and Experience

To ensure that TT is achievable, ready and available knowledge must be a key ingredient. The training and experience is a key factor to the success toward product innovation.

b. Communication

Both internal and external communication is necessary for the organization to be successful. Coordination, information gathering and development are all essential for product initiation.

c. Organization Effects

Resistance to change within an organization can effect the product. Cooperation and alignment between the political, culture and technical arenas are a must.

d. Mission Orientation

Recognition of organizational objectives in contrast to functional objectives through mission orientation should increase motivation to achieve appropriate goals.

e. Motivation

Motivation as a force may be divided into four facets for consideration; competition amongs units, reward structure (individual/unit), visibility, and mission/operational readiness enhancement. The expectation of motivation will be the first stimulus used in gaining an advantage which will provide a mental set that increases the awareness of requirements that leads in turn to the utilization of new technology. [Ref.12]

3. Concept of the innovation decision process

Definition of Innovation:

> Innovation is a decision process through which an individual (unit) passes from first knowledge of an innovation to forming an attitude toward the innovation, to a decision to adopt or reject, to implementation of the new idea and to confirmation of this decision [Ref. 12].

The innovation decision process is essential to sound technical transfer development for the 4th MAW, since its organization is presently expanding its role in the computer arena. More importantly, the 4th MAW information systems office must focus on a disciplined approach to technical transfer and innovation since the organization is uniquely designed with both full and part time marines as well as their unit assets located throughout the continental United States. This structure can make process development

operations in four wars and numerous lesser amphibious actions around the globe. The lessons learned have been incorporated, as was new technology, to provide the most effective design for carrying out the squadron mission. Considering the success which the Marine Corps has enjoyed, any attempt to redesign operating procedure would be looked upon as unnecessary and contrary to status quo. Consequently socio-technical design will have to be implemented incrementally.

This does not necessarily mean that the present political system will only support the socio technical restructuring of discrete functions such as word processing and communications. What it does imply is that discrete activities such as training, administration, maintenance, and operations can be changed internally to incorporate socio-technical design without undue stress on the present organizations´ operating structure. These incremental changes will eventually alter the socio-technical structure of the activity in which they are made, gradually affecting the overall organization design.

The place to start implementing changes would be in the training activities which prepare marines for jobs involving computer usage. Planting the seeds of socio-technical design early in a persons development can have a tremendous impact when that person matures in rank and acquires the political clout necessary to change his activity´s modus operandi. There are a number of job design methods which can be used to train marines not only to operate computers but to use them as integrating mechanisms for communications sharing between squadron counterparts.

In addition to formal classes, task forces, team assignments, brainstorming sessions, and work shops all have value as training vehicles. The task force and team assignments are especially valuable for training less experienced people when they are teamed with more knowledgeable people from the organization. (Large bases such as MCAS El Toro now have information resource centers where marines can learn from the experiences of others who are adept at computer operations). In this way the junior members gain from the experience of the other team members while the team as a whole profits from the junior members' fresh perspective, which may lead to a new solution to the problem at hand. Brainstorming sessions act as training opportunities because of the free exchange of ideas from participants with a variety of perspectives, specialties and experience levels. In a training environment rank barriers are usually lowered allowing both senior and junior personnel to ask questions and make suggestions not normally tolerated in an operational environment. The greatest lesson to be learned from brainstorming is that many ideas, which may be so zany that they would never be mentioned in a more constrained atmosphere, can be slightly modified and turned into effective solutions to a problem. Workshops allow practical application of concepts and methods in a controlled setting. Workshops are particularly effective in training many people at one time, especially after these people have had some formal education in the topic at hand.

When marines are trained in this way they will bring these innovative job design techniques back to their respective departments or activities. In this way their computer experience can be used not only for more efficient operation of the equipment but also for setting up new structures and linking activities more conducive to the integration of social and technical activities. This will pave the way for the overall organizational change needed if the 4th MAW is to keep in step with the present technological trend.

IV. DISCUSSION OF THE INFERENCES

A. METHODOLOGY

Six copies of the Modern Office Technology Survey were distributed to each of the twenty four major groups comprising the 4th MAW.(Figure 4.1) More significance was placed on the return of at least one survey from each unit than on the total number of surveys completed and returned. This was due to the frequency of like responses on surveys received from the same command. The 87% response rate from the sites is considered a fortunate organization-wide representation of collected data. It can be stated that the wants, needs, and deficiencies reported are indicative of the actual 4th MAW requirements and deficiencies.

Responses were solicited using; yes/no, numerical, and informationally specific and non-specific type questions. A demographic section was included to discern the basic credibility levels of the respondents. Figures 4.2, 4.3, 4.4, and 4.5 present this demographic data while Figure 4.6 displays the statistical data for each response. Questions, like twenty six and thirty five, which solicit non specified responses, are analyzed in greater detail and therefore omitted from Figure 4.6.

UNIT	LOCATION	RESPONSE QUANTITY
MAG-42	Alameda	5
MAG-41A	Andrews	1
MACS-23	Aurora	2
MAG-46B	Bellechase	0
MAG-42A	Cecil Field	1
H&MS-49B	Cherry Point	3
MAG-41	Dallas	1
MACS-24	Dam Neck	1
MAG-46	El Toro	5
4th LAAM	Fresno	10
MACG-48	Glenview	1
WES 47-	Greenbay	4
4th LAAM-B	Hayward	2
MAG-41B	Marietta	0
MAG-42B	Memphis	0
MAG-46A	Norfolk	5
4th LAAM-A	Pasedena	1
MWSG-47	Philadelphia	1
MWSG-47	Selfridge	6
MAG-49A	South Wey	5
MWSG-47A	Twin Cities	7
MAG-42C	Whidbey	4
MAG-49	Willow Grove	4
HQSQDN-47C	Wyoming	1

24 UNITS SURVEYED
21 RESPONDED
70 INDIVIDUAL RESPONSES
87.5% SITE RESPONSE RATE

Figure 4.1 Survey Distribution and Responses

B. DEMOGRAPHICS

Figures 4.2 thru 4.4 show demographic comparisons between survey samples and the 4th MAW total population. Figure 4.2 shows that the majority of respondents held the rank of Sergeant, Staff Sergeant, or Gunnery Sergeant with the modal rank being that of Sergeant. From Figure 4.3 we can see that the respondents minimum and maximum ages are nineteen and fifty five respectively with the majority falling between the ages of twenty three and thirty seven. The mean age is thirty three and the median age is thirty two. The education levels depicted in Figure 4.4 equate to 45% of all respondents having competed some college credit courses. The majority of respondents gave a specific job title rather than their major department/section. Figure 4.5 groups the respondents by the four major departments: administration (S-1), operations (S-3), maintenance; and logistics (S-4). For example; legal, career planning, personnel, and public affairs were grouped under administration (S-1). Intelligence (S-2) was included in operations (S-3) and all types of maintenance to include radio, aircraft, equipment, and vehicle were made part of the general maintenance category. Of the fifty four respondents, 56% of them worked in administration, 20% in operations, 19% in maintenance, and 5% in logistics. It can be inferred from these responses that at least three micro

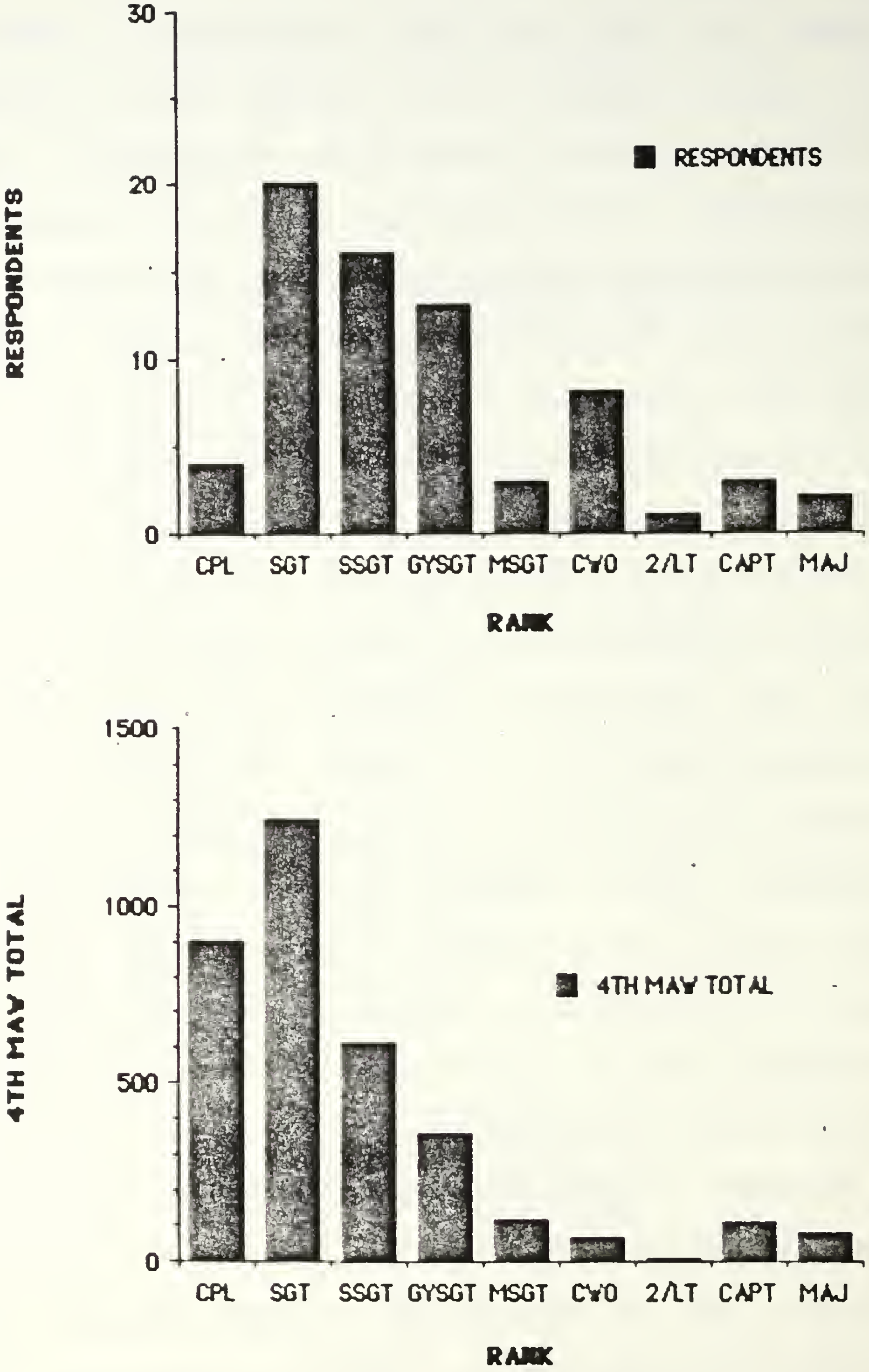
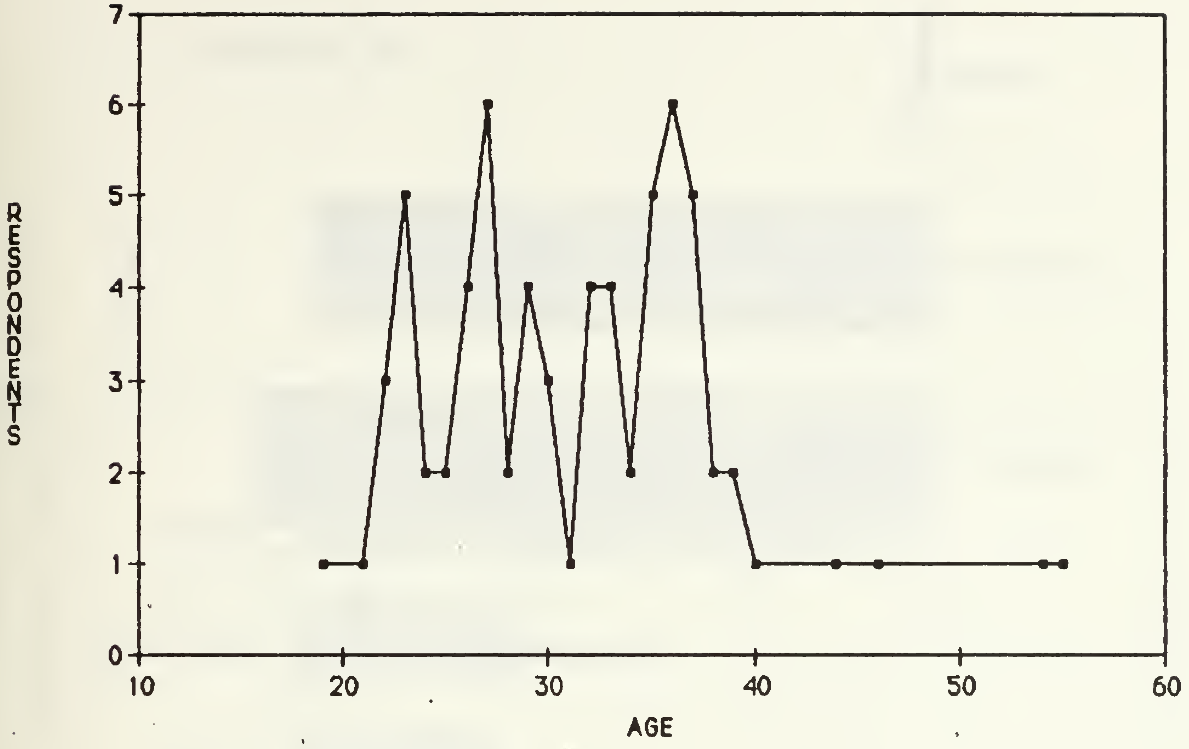


Figure 4.2 Survey Rank Distribution Versus 4th MAW Rank Distribution



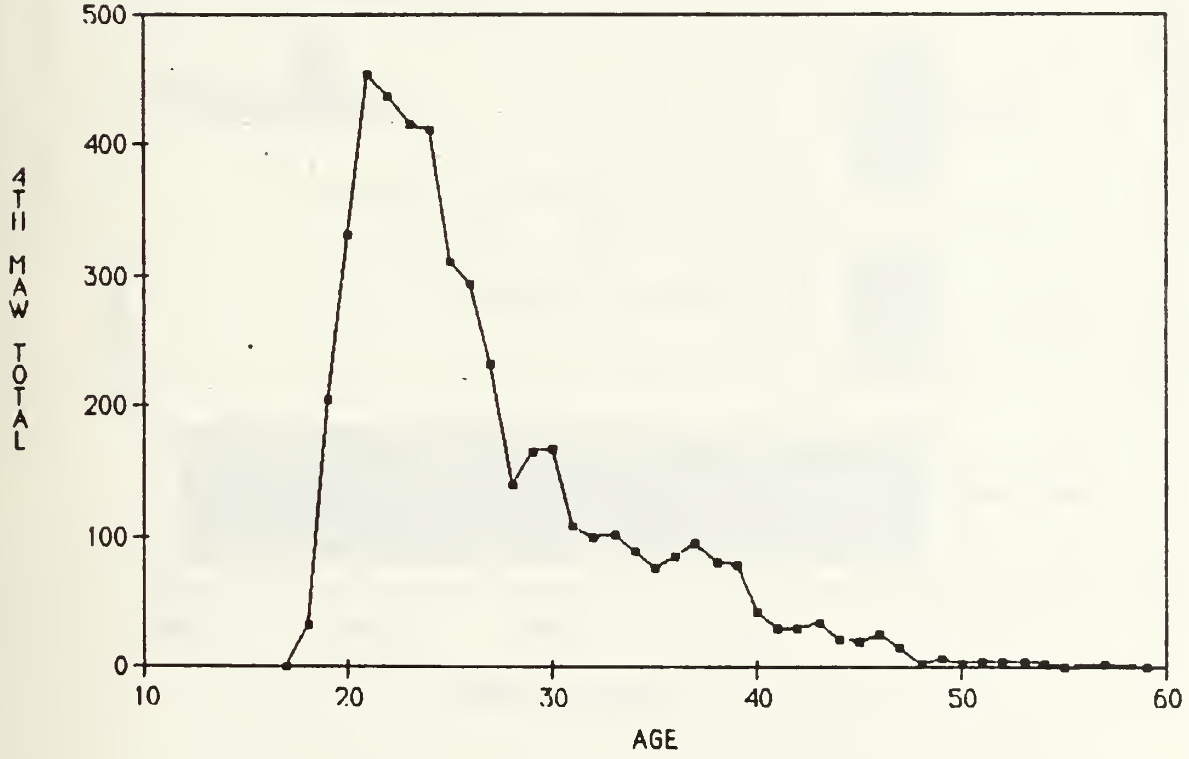


Figure 4.3 Survey Age Distribution Versus 4th MAW Age Distribution

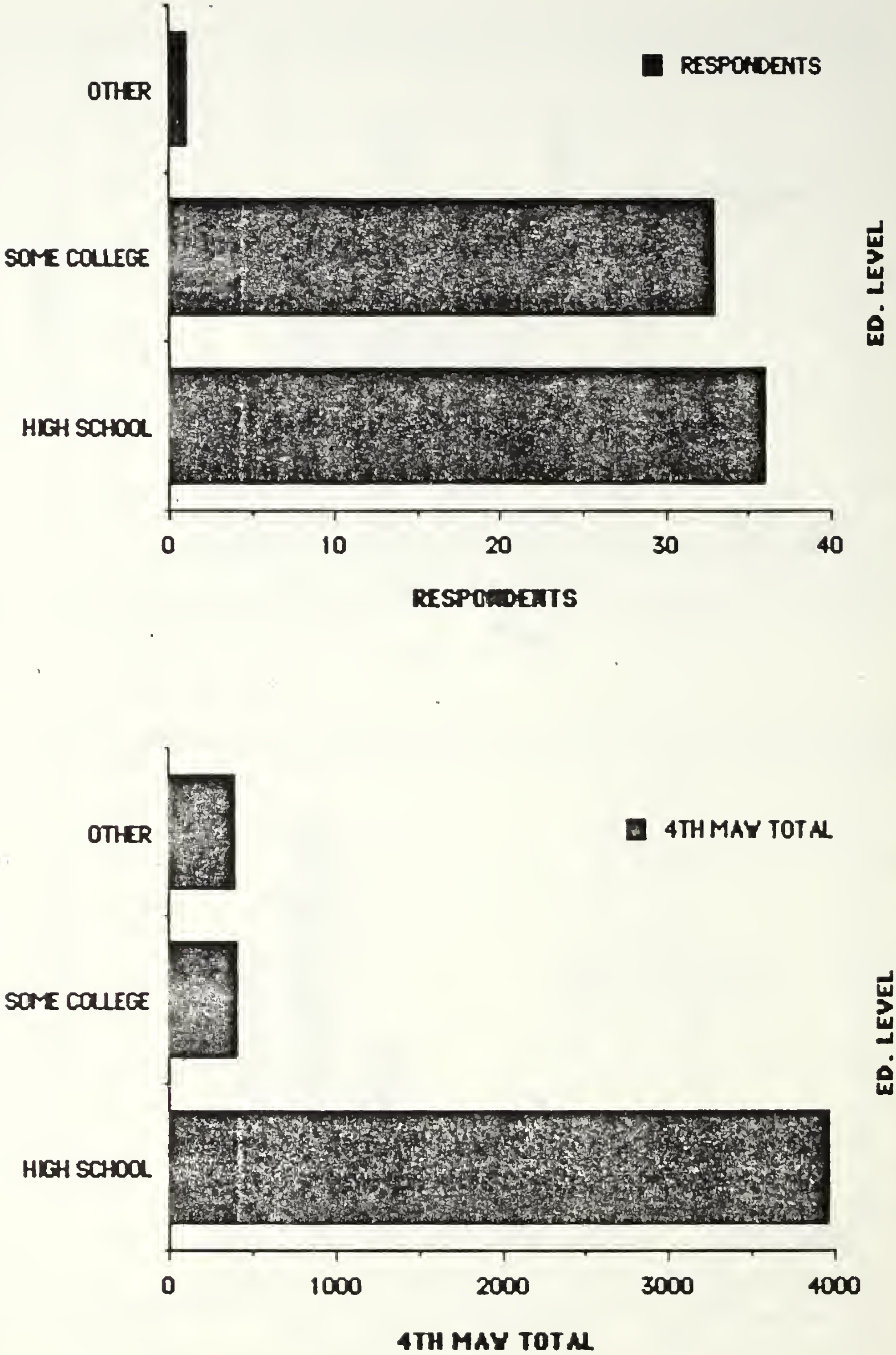


Figure 4.4 Survey Respondants Education Levels Versus 4th MAW Education Level

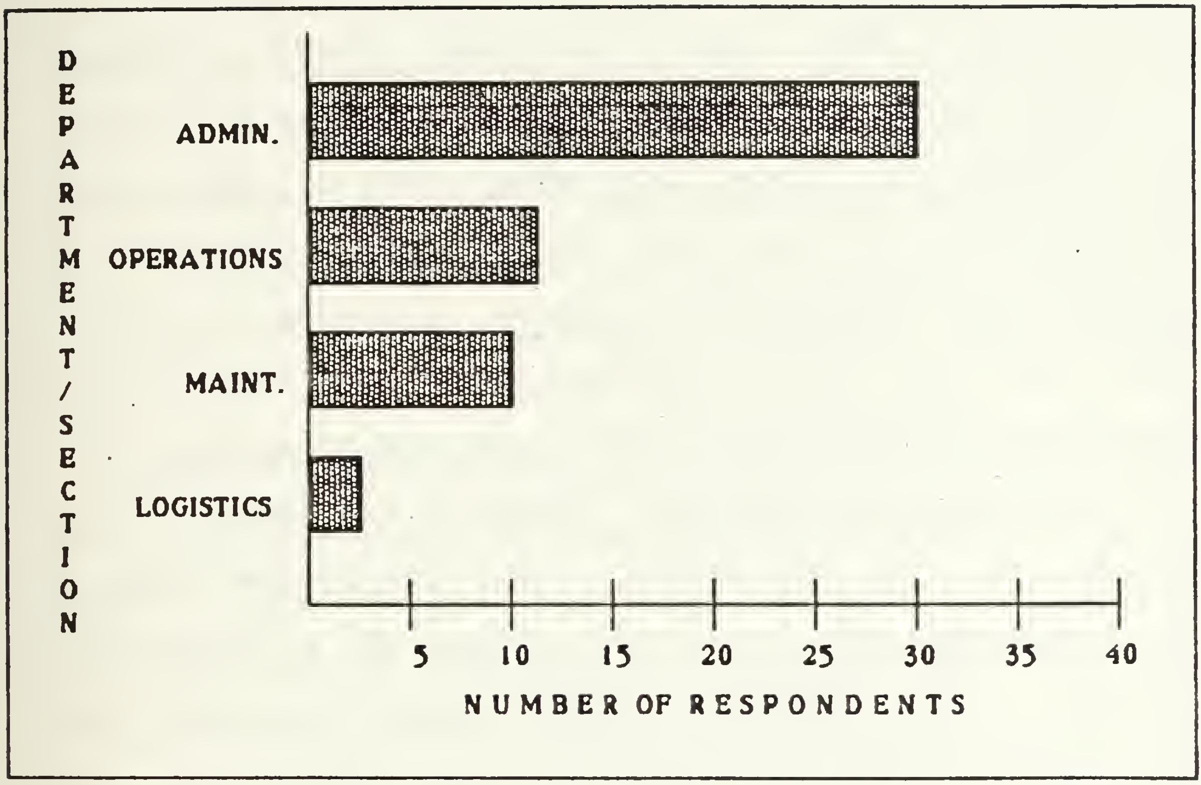


Figure 4.5 Survey Department/Section Distribution

computers are needed - one to each of S-1, S-3 and maintenance, with S-1 a strong candidate for more than one.

C. SURVEY DATA

The Modern Office Technology Survey is located in Appendix A, page 121. Survey response data is shown in Figures 4.6A thru 4.6I pages 67 thru 75. Questions one through five deal with the 4th MAW´s computer allowance, personnel assignments, and skill levels. Question one became a moot point when a copy of the 4th MAW microcomputer allowance data was received, although the responses did coincide with the actual allowances. 58% had between one and two microcomputers and 100% of the respondents acknowledged at least one microcomputer, even if it was "still in the box". Question two seemed to be ambiguous to the respondents and interpreted as to which departments/sections had access to a Zenith 150 computer. The original intent was to find the departments/sections which actually owned their own. The inference here is that more departments/sections use the microcomputer than actually own one. Question three was significant in that it showed 80% of the respondents were from units which had three or more people assigned to use the micro computer with 29% reporting ten or more. This is a substantial block of users that warrant technical occupational training as would any other military occupational speciality. The modal response to question four was that between one to three of the people assigned to use the microcomputer from each unit are familiar with programming. According to the responses to question five, 20% of the respondents were from units where no personnel have any programming skills and the majority of people who could program are doing so in Basic and DBase. The overall familiarity with these two languages, and their ease of use and versatility, make them good candidates for implementation as standardized languages throughout the 4th MAW. Training costs would be greatly reduced considering the large bank of "corporate knowledge" which already exists.

Questions six through eleven deal with the present level of expertise, the type of training offered (past and present). and the willingness of personnel to be trained. Question six shows that 85% of the respondents have had one to five hours or less of formal training on the Zenith 150. The bulk of the training was directed toward system operation, word processing and data base programs, as can be seen from the responses to question seven. Either spreadsheet type programs are not required for the marines to perform their duties or not enough technical assistance was provided to them to enable effective use of these programs. According to the tally for question eight, only 17% of the respondents are attending any type of computer or programming classes. The responses to part D. of question nine (other source), imply that the preponderance of training is conducted as technology transfer from within the organization. Some comments were made concerning the use of local GSA and NARDAC services where applicable. This could be an excellent solution to specific problems encountered with military contract- compatible equipment. Funding may be required depending on the particular services desired.

The fact that eleven respondents had received no training at all and that fourteen of them never used tutorials is a significant problem requiring further investigation. Question ten showed that an overwhelming 97% of the target groups were interested in receiving more training, predominantly in the use of software, in programming and in system operation.

Questions twelve through sixteen try to identify specific problems which could be solved by the introduction of some type of technical training program. It can be seen from the responses for question twelve that understanding and comprehension of technical user manuals and actual usage of the software packages provided, are causing the majority of the problems. Write in comments like, "too hard to read user manuals" and "the software is more difficult to use because it is outdated", reflect upon two areas where change is needed, namely training and acquisition, both of which go hand in hand.

The responses to question thirteen are a good indication that the SuperCalc 3 program is generally unsuitable to aid in mission performance and is thus "shelved" by 62% of the target group. Question fourteen shows an 86% usage rate for the Multimate program with problems evenly distributed between understanding technical manuals and mission adaptation. This area is a good candidate for the introduction of tutorials and training through technical transfer. According to question fifteen, 88% of the respondents are using DBase 2 and 74% of them are experiencing either technical manual or mission adaptability problems. The usage percentages from questions fourteen and fifteen clearly show the requirement for word processing and data base type programs. This being the case, the levels of technical competence and computer literacy must be raised to enable the units to perform their mission using programs of this type.

The responses to question sixteen show that of the 88% of respondents using DBase 2 only 26% of them understand the mechanics behind programming this software to aid in mission accomplishment. The development of new programs is essential for the advancement of the socio technical design. This cannot be accomplished if 74% of the users are merely "plugging in" data in already existing programs with little regard for designing follow on programs.

Questions seventeen through twenty two try to identify specific areas where micro computers and software programs are being used and possibly could be used to support the mission of the 4th MAW. Responses to question seventeen clearly show that data base programs have been developed for some very pertinent areas of 4th MAW operations, 67% of the respondents have developed at least one program to aid them in mission accomplishment. This constitutes a significant block of informed users who could form the basis for the proliferation of technical transfer throughout the entire organization. In addition to the specific functions listed in question eighteen, other uses mentioned for the Zenith 150 were for; rosters, training jackets, publications, and mailing lists. Two respondents were still using it for dust collection.

Responses to question nineteen are indicative of a 97% reliance on manual methods to aid in the preparation for flight planning. The United States Air Force owns and utilizes programs to aid in every area of flight operations. Personal experience has shown that programs to integrate weather information with navigation planning already exist and that flight planning time, using the computer, can be reduced to one fourth that of doing the calculation manually. Accuracy of data and standardization of planning techniques are two other areas greatly enhanced by the use of microcomputers. Operations sections supporting flight operations need to re-evaluate the present system and take a serious look at acquiring programs which can aid in tactical mission flight planning.

It can be deduced from question twenty that 13% of the marines own their own personal computers. In many cases a single well informed microcomputer user can form the nucleus of a training program aimed at educating the majority of the organization´s personnel. This is exactly what is being done in computer resource centers at bases such as MCAS El Toro, California. This is a strong case for the use of technology transfer, considering that 87% of the respondents reported that one or more marines in their unit possessed a microcomputer with 23% reporting six or more per unit.

Question 21 shows almost a complete lack of program development to assist in the performance of aircraft maintenance tasks. This is an area that readily lends itself to the introduction of various data base and spreadsheet programs which could increase accuracy and reduce man hours. Perhaps the introduction of some sample programs, like the phase maintenance example in appendices (B and C) will give marines an idea to build on and develop programs more tailored to their specific needs in the aircraft maintenance area. Answers to question twenty two show that 72% of the marines who own a personal computer are using them in addition to the microcomputers available. A clear indication that more microcomputers are needed in the organization.

Questions twenty three and twenty four deal with the use of modems and are a precursor to follow on questions which will indicate whether or not the requirement for a LAN exists. 76% of the respondents are from units which own modems and 30% of these units do not use them. This reduces the inter-organization communication potential by more than 50%.

Questions twenty five through twenty seven are concerned with software acquisitions in addition to the normal issue, and the specific types of programs which could be used to ease the information processing burden in the organization. According to question twenty five, only 20% of the respondents are from units where additional "off the shelf" or tailor made software packages have been made available either by 4th MAW issue or private purchase. However we can see from the positive response rate of 70% on question twenty seven that there are many areas within the organization which could be better supported by additional software packages. The write-in comments for question twenty six make a strong case for updating the existing issued programs and acquiring some new ones. The majority of the 20% using additional software packages have updated DBase II with DBase III and DBase III Plus and updated their word processing packages with more powerful easier to use programs like Word Perfect. Typing tutors, spell checkers, Sideways and Lotus 1,2,3 have, for the most part, not been acquired but are in demand.

The specific areas mentioned in question twenty seven, where additional software would increase the efficiency and effectiveness of a particular operation, covered the entire repertoire of 4th MAW tasks: Administration to include, unit diary, fitness reports, promotions, career planning, and urinalysis testing; operations, to include, training, flight hour tracking, and aircrew rosters; and logistics and maintenance, encompassing, float tracking, master fiscal, ton log, parts, supply, and maintenance administration.

Questions twenty eight through thirty four deal with the present attitude in the 4th MAW toward office automation and allow inferences to be made regarding technology saturation levels (too much too fast), willingness to accept changes brought about by the microcomputer, and whether or not these changes have increased the productivity and efficiency of the organization. According to the results for question twenty eight and twenty nine, half of the respondents feel that their units have adequate computer support, although 87% feel that there is sufficient justification for the introduction of more machines. Adequacy must be measured against the improvement in efficiency and effectiveness derived from further systems development. Cost benefit analyses are required to solve this problem on an individual unit basis. Most units are working with three different types of computers. Although they may be adequate for the present situation, they are non-compatible and preclude any future expansion without the expensive acquisition of new technology. Using micros to replace the existing machines can solve both cost and compatibility problems.

Two thirds of the respondents to question thirty have enough confidence in advanced technology to trust it to perform well in a tactical environment. It an be inferred that the computer will no longer be a "nice to have" garrison item but one that will be necessary in both garrison and in the field. All the data necessary for squadron operations will be contained in computer software data bases and it will be impossible or extremely impractical to revert back to manual methods. As is the case with advanced aeronautical flight systems and computer centers servicing large financial and business institutions.

An overwhelming 96% of the target group feel that the microcomputer is improving productivity in the sections that use it. Considering the responses to the previous question bank, more microcomputers would mean even more productivity to the majority of 4th MAW units. Only 7% of the respondents to question thirty two indicated that the new microcomputers have generated any more unnecessary and useless reports than the old manual systems.

Question thirty four was designed to determine the need for some form of intercommunications capability between sections within a squadron, squadrons within a group, and groups within the 4th MAW. 90% of the respondents desire to communicate with some other sub unit within the organizational structure as a whole. Presently the majority of units are equipped with only two micros. Interest in a LAN for inter-department/inter-section communication will increase as more micros are added to the squadrons and groups. The responses indicate that, at present, communication with 4th MAW headquarters is most desirable and that inter-group and extra-organizational communication are the next areas in line for introduction of network operations. Chapter VI discusses the various types of networks available and their suitability to the various areas within the 4th MAW organizational structure.

The areas where the development of new software would be desirable and advantages for more effective mission accomplishment are numerous. The responses provide insight as to the wide range of tasks which can be made more efficient if computerized. Some of these areas provide an excellent opportunity for future project development or thesis study as they affect the Marine Corps as a whole. Other areas mentioned have software already developed for them and would be prime candidates for technology transfer. All areas mentioned are listed below. It is the intent of the authors that at the reading of this thesis, interested parties whether with, or desiring information about these areas, would contact the 4th MAW Information System Officer. He could in turn refer them to units within the 4th MAW organization or external agencies like the Marine Corps Development Center for possible assistance.

Areas include; maintenance combat essential equipment reporting, maintenance instruction manuals/SIMS, parts and equipment flow, table of equipment, embarkation, record keeping, a personnel data base, cutting scores, public affairs newsletters, deployment information, LM2 reports, VOTEC, readiness control, interactive data base for fitness reports, muster sheets, training by tutorial, training management records and forms, flight time information, operation orders, updating flight hours, aircrew rosters, mapping data and graphics.

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
1.	A	58	70	83%
	B	9		13%
	C	1		1%
	D	1		1%
	E	1		1%
2.	A	66		
	B	3		
	C	8		
	D	15		
	E	12		
3.	A	14	70	20%
	B	36		51%
	C	13		19%
	D	7		10%
4.	A	14	70	20%
	B	39		56%

Figure 4.6A Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
4.CONT.	C	16		23%
	D	0		0%
	E	1		1%
5.	A	42		
	B	6		
	C	9		
	D	7		
	E	2		
	F	38		
	G	16		
6.	A	35	70	50%
	B	4		6%
	C	0		0%
	D	6		9%
	E	14		20%
	F	11		15%

Figure 4.6B Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
7.	A	36		
	B	41		
	C	4		
	D	27		
	E	9		
8.	A	12		17%
	B	58		83%
9.	A	2		
	B	2		
	C	0		
	D	34		
	E	1		
	F	29		
10.	A	68		97%
	B	2		3%

Figure 4.6C Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
11.	A	52		
	B	52		
	C	42		
	D	22		
	E	32		
	F	6		
12.	A	9		
	B	29		
	C	13		
	D	24		
13.	A	12	70	17%
	B	12		17%
	C	43		62%
	D	3		4%
14.	A	17	70	24%
	B	16		23%

Figure 4.6D Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
14.CONT.	C	10		14%
	D	27		39%
15.	A	30	70	43%
	B	22		31%
	C	8		12%
	D	10		14%
16.	A	18	70	26%
	B	24		34%
	C	28		40%
17.	A	44	67	66%
	B	23		34%
	C	11		
	D	5		
	E	4		
	F	21		
	G	1		

Figure 4.6E Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
17.CONT.	H	8		
	I	4		
	J	13		
	K	5		
	L	7		
	M	27		
18.	A	8		
	B	14		
	C	7		
	D	4		
	E	12		
19.	A	2	70	3%
	B	68		97%
20.	A	9	70	13%
	B	45		64%
	C	7		10%

Figure 4.6F Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
20.CONT.	D	6		9%
	E	3		4%
21.	A	3		
	B	4		
	C	4		
	D	40		
	E	24		
22.	A	48	60	72%
	B	3		5%
	C	0		0
	D	1		2%
	E	14		21%
23.	A	53	70	76%
	B	17		24%
24.	A	6	70	9%

Figure 4.6G Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
24.CONT.	B	16		22%
	C	30		43%
	D	18		26%
25.	A	14	70	20%
	B	55		79%
	C	1		1%
27.	A	49	70	70%
	B	21		30%
28.	A	34	70	49%
	B	36		51%
29.	A	9	70	13%
	B	61		87%
30.	A	18	70	26%
	B	52		74%

Figure 4.6H Survey Data

QUESTION	SELECTION	# OF RESPONSES	SAMPLE SIZE	%
31.	A	67	70	96%
	B	3		4%
32.	A	23	70	33%
	B	20		29%
	C	22		31%
	D	5		7%
33.	A	69	70	99%
	B	1		1%
34.	A	63	70	90%
	B	7		10%
	C	10		
	D	15		
	E	21		
	F	32		
	G	18		

Figure 4.6I Survey Data

V. DIAGNOSIS USING TICHY´S "OPEN SYSTEMS" MODEL

A. FRAMEWORK FOR AN "OPEN SYSTEMS" MODEL

The open systems model for organizational change, proposed by Noel M. Tichy, explicitly examines the technical, political, and cultural dynamics involved in organizations[Ref. 15]. He purports that the synergistic strength gained from aligning these subsystems is vital for successful mission accomplishment. Lack of attention in any one of these areas weakens the system as a whole and can cause its failure. Figure 5.1 shows the technical, political and cultural cycles in terms of peaks and valleys. Peaks represent high stress and a high need for adjustment in one of the three problems areas. The valleys indicate a smooth, non-problematical period for that cycle. For example the technical cycle probably peaked when the 4th MAW received its first Zenith 150 micro computers. The Modern Office Technology Survey in conjunction with personal interviews and personal experience have been used to glean the information needed to diagnose this organization in terms of its technical, political, and cultural cycles. This will facilitate the finding of peaks and valleys which will highlight areas where recommendations for adjustments need to be made, in order to align the organizations´ three subsystems.

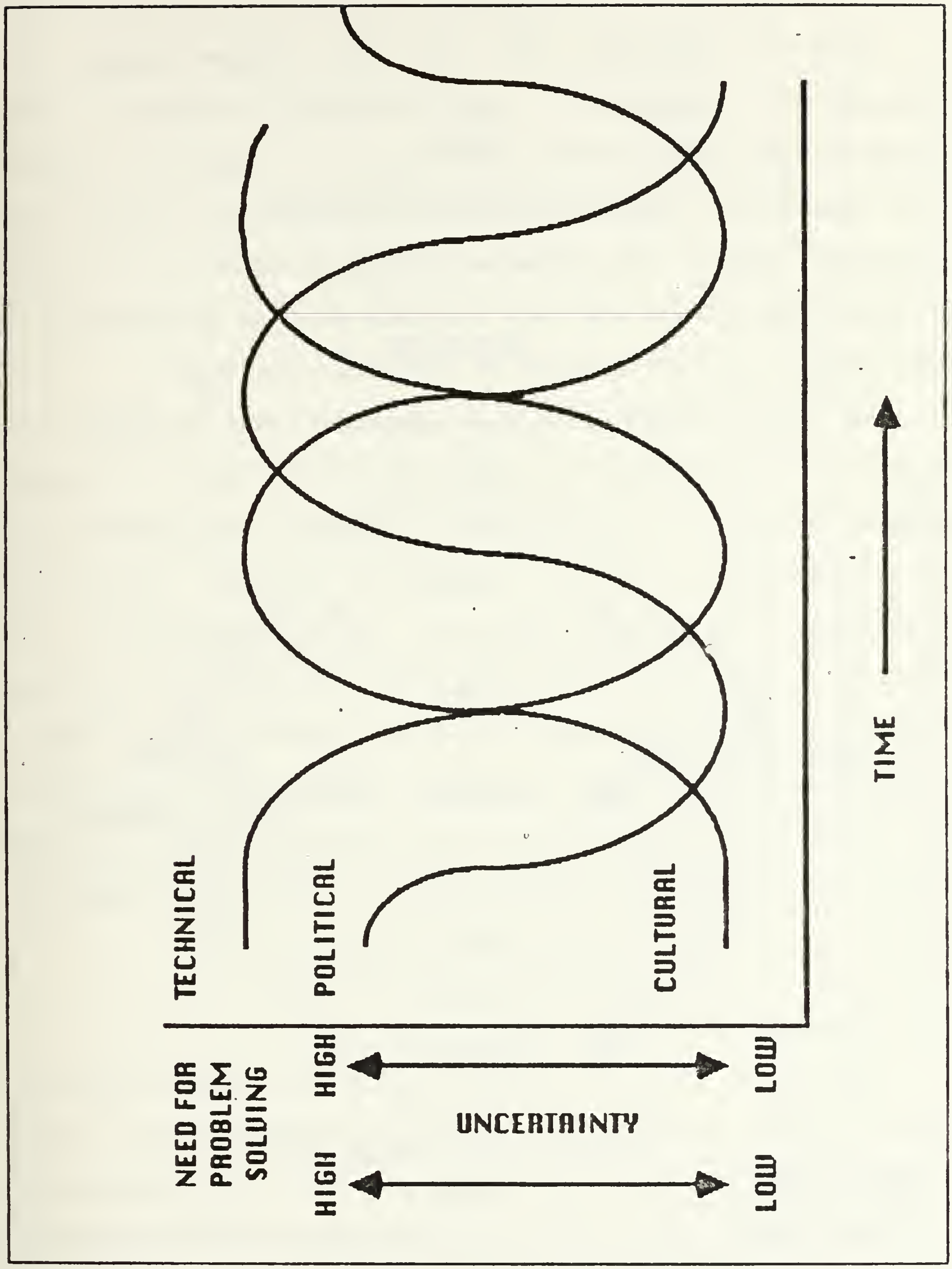

TECHNICAL
POLITICAL
CULTURAL
TIME
NEED FOR PROBLEM SOLVING
HIGH
LOW
UNCERTAINTY
HIGH
LOW

Figure 5.1 Technical, Political, and Cultural Cycles

Tichy´s framework for the open systems model is depicted in Figure 5.2. This framework is based on the premise that organizations use inputs of capital, people, and material to create a service. Some of the outputs are tangible, such as full mission capable aircraft or close air support, and others are less tangible such as the measure of the morale and satisfaction of individual marines.

The core assumption of any organizational assessment is that an organization is more successful with a greater degree of "fit" or alignment between its environment, mission/strategy, tasks, people, formal structure, processes, and emergent networks. This assessment of the 4th MAW ultimately aims to help the organization address strategic socio-technical concerns in the areas of office automation and technical transfer. The technical, political, and cultural systems will be broken down to show how they effect the mission/strategy, tasks, prescribed networks, people, processes, and emergent networks.

B. HISTORICAL PERSPECTIVE

Experience was an adequate guide for making decisions when changes could be made in small increments on a local level. This is no longer the case for an organization involved with global maritime strategy in an extremely volitile world. Readiness and quick response times are dependent upon timely, accurate, information flows from

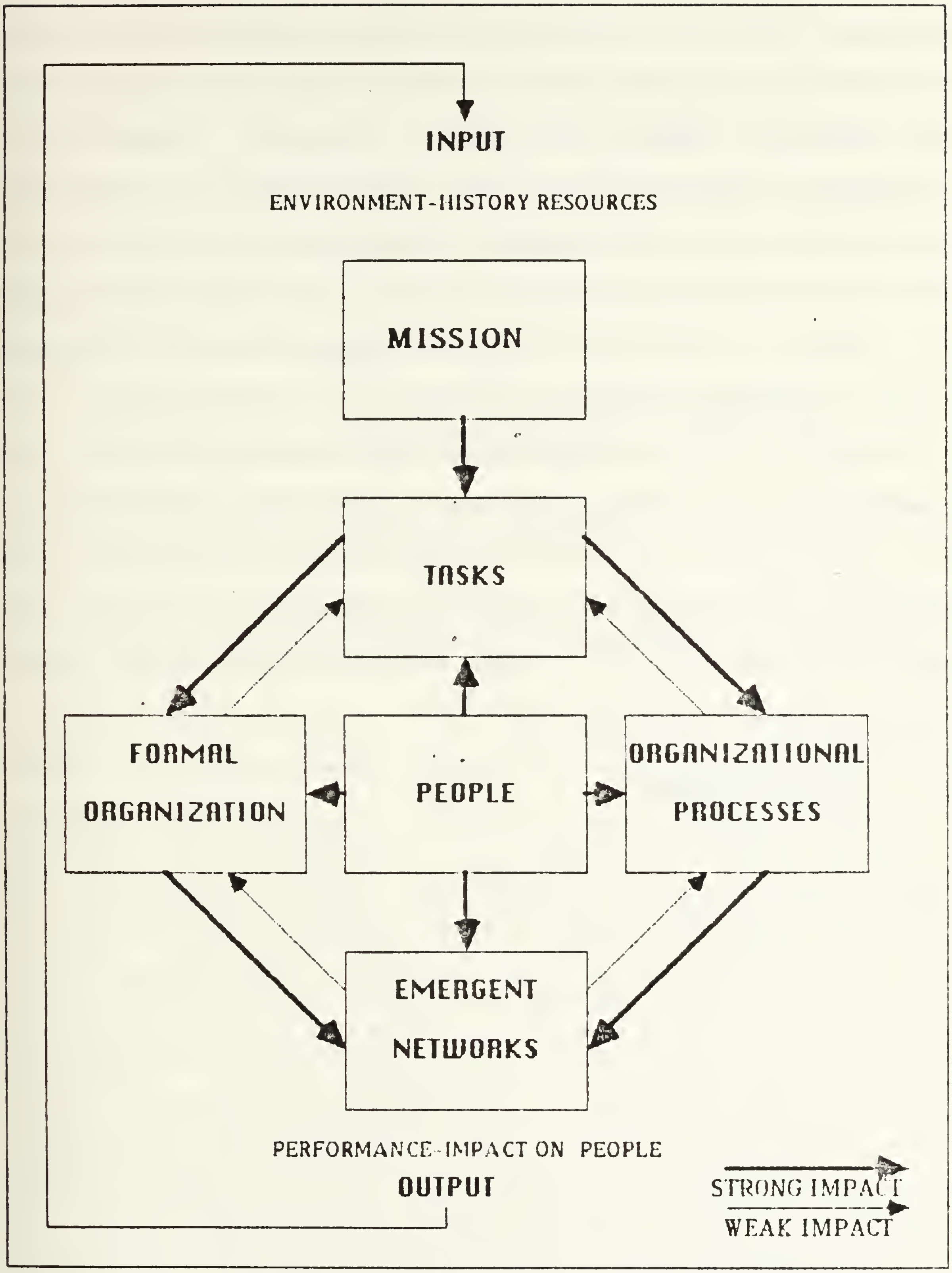

INPUT
ENVIRONMENT-HISTORY RESOURCES
MISSION
TASKS
FORMAL ORGANIZATION
PEOPLE
ORGANIZATIONAL PROCESSES
EMERGENT NETWORKS
PERFORMANCE-IMPACT ON PEOPLE
OUTPUT
STRONG IMPACT
WEAK IMPACT

Figure 5.2 Tichy´s "Open Systems" Model

external as well as internal sources. Each unit in the 4th MAW is an open system surrounded by an unpredictable environment where constantly changing commitments, competition for resources and development in technology necessitate the introduction of new processes or strategies to carry out the prescribed mission. The accelerating rate of change in technologies is producing a Marine Corps in which customary managerial habits and organizations are inadequate for exploiting these advancements and extolling their benefits. The recent proliferation of microcomputers in the 4th MAW may eventually call for organization-wide changes to not only the technical subsystem but also to the political and cultural subsystems which support the actual employment of these machines.

C. THE ENVIRONMENT

The first component to be aligned will be the environment, which includes the social, political, and economic factors which provide opportunities and or constraints to the 4th MAW's efficient and effective use of office automation. The 4th MAW is dependent on Headquarters United States Marine Corps for matters of general policy. To a large extent 4th MAW is "locked in" technically, politically, and culturally to major acquisitions and organizational design changes to accommodate new technology. Several non-technical or people related issues not only affect the 4th MAW but all of the computer industry throughout the United States. The most important of these environmental issues is the increasing shortage of competent, skilled, people in the United States to translate new technology into ongoing systems and processes within organizations[Ref. 8]. These shortages, severe in 1982, will worsen in the next decade because:

* The number of individuals reaching their 18th birthday in the decades between 1978 and 1998 is estimated to drop by 27 percent.

* College curriculums have been reworked and simplified to accomodate the 15 percent decline in scholastic aptitude test scores.

* The availability of professional information systems faculty at high schools and colleges is shrinking because of lucrative careers in industry.

The complexity of the environment in terms of the number of domains and organizations which personnel must actively deal with, the stability of the environment, and how quickly change occurs and the predictability of these changes have a tremendous impact on the input end of this open systems model. The military procurement process has been traditionally too slow to keep up with rapid changes in technology. The microcomputer acquisition process was recently revamped to remedy the situation. The problem will soon be centered around acquisition of qualified personnel to operate the numerous technologically advanced machines which are being purchased. These environmental inputs are fixed by Marine Corps recruitment criteria in the case of personnel and by computer acquisition guidelines in the case of hardware and software.

The 4th MAW environment is rigid and predictable. Plenty of lead time normally occurs between the initial acquisition and final receipt of new systems although rarely is any training program established during this lead time to prepare marines for its implementation and follow-on usage. The preliminary documentation on the new FMF EUCE concerning its general use and operation characteristics should be sent to units now-not after receipt of the equipment. The 4th MAW is in the early stages of the computer technology cycle and generally the capability to program for operation needs is inadequate. These skills or at least the ability to contract for them require further development.

4th MAW units are actually ahead of their "Regular Marine Corps" counterparts in the development of these skills. The reservists of the 4th MAW bring with them a blend of civilian occupational experiences which include many that are information systems related.

D. MISSION

Mission/strategy includes the organizations' reason for being, its basic approach to carrying out its mission, its strategy, and its criteria for effectiveness. The key players involved with microcomputer system implementation and use were queried concerning their perceived notion of the mission/strategy and objectives of personnel. Although the marines surveyed were able to understand the need to integrate the computer to support operational requirements, a solution to the problem of how to strategically implement the people, hardware, and software has not been fully developed. A strategy for deployment and use of computer systems has not been specifically defined or standardized for use throughout the 4th MAW. Organizations change much more slowly than technology and must grow to productively assimilate new information system services. As Nolan and Gibson demonstrated, an organization passes through stages in assimilating technology[Ref. 16]. Recent work in office automation has discovered this model to be a special case of the broader problem in the learning cycle of adapting technology to organization needs[Ref. 17].

How individual marines rate possible system goals and how strategic decisions are actually made need to be taken into account to fully understand the mission and strategy. The technical cycle is affected by environmental threats and opportunities, strengths, and weakness of the organization and whether resources are fitted to an already defined mission. There is no standardized strategy or set of guidelines to develop programs, computer communication networks, or training procedures which well enable the computer to function as an aid to mission accomplishment.

Present strategy development is decentralized and unit specific. A more developed and complete strategy is normally formulated and implemented when top leadership in a particular unit is interested in information systems processes and how they relate to mission performance. "Organizational fit" is the issue in this case. In some instances the controls and procedures implicit in the distributed approach better fit organizations which are highly decentralized and or organizations which are highly geographically diverse[Ref. 8]. Even though geographically dispersed the 4th MAW is a centralized structure and for all but the most decentralized of organizations there is a strong need for central control over standards and operating procedures. The changes in technology however, both permit and make desirable in some settings the distribution of the execution of significant amounts of the hardware operations and data handling.

The political cycle is affected by who gets to influence the mission and strategy and the managing of coalitional behavior around strategic decisions (i.e., whether the information systems officer is dynamic enough to influence the decision of department heads who provide direct input to CO/XO). The goals concerning information systems development are not unilateral among units. Key staff formulate goals based on their perceived need for automation to perform the assigned tasks. Lack of exposure to computer technology on behalf of key personnel can have a limiting effect on strategy formulation. The cultural system is affected by managing the influence of values and philosophy on mission and strategy and developing culture aligned with this mission and strategy.

E. TASKS

Tasks refer to the technology by which the organizations´ work is accomplished. Is the Zenith 150 being employed as a system of hardware, people, and procedures or does it merely replace the typewriter as a more efficient word processor? These tasks can range from very routine, as in typing standard reports, to moderately complex, like using data bases to track aircraft engine high times and project ready status. Research indicates that the majority of units are planning to expand computer usage to include basic programming data bases and limited spreadsheet operations, although at present, word processing remains the mainstay. Whether these tasks are pooled, sequential, or recycled effects the physical location of computers within the squadron environs.

If the strategy changes and new tasks are developed for the Zenith 150, and the FMF EUCE the organization will have to be redesigned. Adjustments to the integrating mechanisms, especially to the management information flow, will have to be made. An alternative may include organizational restructuring to elevate the ISMO in the units hierarchical design. A recent example of restructuring occurred at 4th MAW headquarters. The 4th MAW Information Systems Officer (ISO) now reports directly to the Chief of Staff vice G4. On the squadron level this could mean that the ISMO reports to the CO or XO as a special staff officer.

Physical connections like local area networks (LANS) may be required to link key decision makers on a real time basis. Implementation of real time computer communications through the use of already issued modems is now a feasible alternative to the telephone, telefax, and express mail. The internal governance structure, the effectiveness of lobbying in the influence of external constituencies, and operational coalitional activities to influence tactical decisions affect the political cycle. At the unit level, the job of ISMO is assigned as a secondary or collateral duty. No formal education is required and selection is based on non standardized criteria. Lobbying to acquire personnel with operational line skills (e.g. engine mechanics, embarkation specialists, avionics technicians etc.) is a popular activity but as yet does not include vying for staff personnel with computer skills. The Modern Office Technology Survey shows that tasks which are performed on the computer are not unique to any one department or section. This emphasizes the requirement to have skilled computer operators throughout the entire unit. These marines should be sought after in a more aggressive manner. The cultural system can be influenced by the use of symbolic events to reinforc, culture, role modeling by key people, (CO, XO, and department heads) and by clarifying and defining values. (In one unit the XO and Administration Department Head (S1) had personal micros which facilitated most business conducted between them. It also reflected and reinforced a positive attitude toward the use of new technology and because it stemmed from key personnel others felt it necessary to get involved by learning how to utilize this system).

F. FORMAL ORGANIZATION

The formal organization refers to the prescribed network component which consists of the definition of jobs. It includes the organization of subunits, communication and authority networks, as well as structural mechanisms for integrating the organization. Presently rules, programs and SOP´s regarding information systems are limited in scope. Further development of simple, mid-level, and complex integrating mechanisms is required. Finding out who does what and with whom is instrumental for initial development of these integrating mechanisms. Each unit within the 4th MAW is differentiated by a functional structure but the organization as a whole reflects wide geographic dispersion to accommodate the manpower needed to staff and operate it. Complex integrating mechanisms, like wing liaison/inspection team visits, are used to span geographic boundaries. Although helpful, these visits are short in duration and do not have a long term impact on the information systems processes in subordinate units. Substantial revision to these processes are necessary. Is better communication needed between these units? (see organizational chart of 4th MAW Figure 2.3) Implementation of better integrating devices will be needed to form both internal and external computer networks between key nodes. To this date analyses have not shown that the cost of these integrating mechanisms makes them untenable to the organization or that the cost simply outweigh the benefits.

The technical system is most affected by the alignment of the prescribed network structure to strategy. Work is already integrated into roles and combined in departments. (i.e., administration, operations, maintenance etc.) To some extent function dictates the regional location of subunits. If you are going to fly you need a military or joint military/civilian air base close to the squadron area. If you are going to work with infantry units by providing close air support then the range of the aircraft must be compatible with the distance between these units. These already existing structures may or may not facilitate low cost microcomputer inter-communication. Balancing of power and resources across these units is accomplished through a political system in which it is assumed that wealth is proportional to need. Managerial style must be aligned with the existing technical and political structure but the cultural system can be affected by the development of subcultures to support the role of office technology and also the integration of this subculture into the larger unit or organization culture.

G. PEOPLE

The people component includes characteristics of the members of the organization including background, motivational patterns, and managerial style. The management can vary from one of risk taking, and seat of the pants, to a formal bureaucracy, and from an organic participative, flexible approach with open communications to a mechanistic autocratic style in a system of organized anarachy. Whether key managers have basic understanding of office automation will have a tremendous impact on the utilization rate and on the overall management competence of their subordinates. Motivation and leadership are the two central issues which drive the people component of the network model. People must be motivated by competent leadership for the organization to initially make changes and for it to achieve any type of improved performance as a result of these changes. In the case of the Zenith 150, marines must be induced to invest energy in new behaviors.

The technical subsystem can be affected by every level of management and labor within the people component of the open systems model. Selecting or developing technical skills and abilities and matching management style with technical tasks are the core strategies used in this area. Research has indicated that there is a sizable block of receptive, trainable marines already performing some of their core tasks with the use of computers. An officer or marine with the appropriate rank who showed an aptitude for or had prior computer experience could be laterally shifted to a department utilizing microcomputers. The assumption here is that there are not enough trained people to go around and that skillful political maneuvering from both within and outside the unit is needed to match political needs and opportunities with organizational operations. A career may be enhanced by successful implementation of office automation, thus benefitting the individual as well as the organization.

Key personnel must utilize cultural leadership skills to affect the cultural subsystem by attempting to match values of the people with organization culture. Demographics play an important part in the acceptance of new technology as well as the organizations´ former perceived cultural view. In the case of the 4th MAW, there is a large span of ranks, ages, and cultural attributes among marines. The vast majority claim interest in broadening their technical skills but only a small minority are participative enough to query sister units and appropriate organization (i.e., NARDAC´s) in pursuit of technical information. Internal and external communication lines are open, although most units seem timid when it comes right down to asking for help.

H. ORGANIZATIONAL PROCESSES

Organizational processes are the mechanisms which enable the formal organizatior to carry out the dynamics of work. They include communication, decision making, conflict management, control, and reward systems. Processes of communication are the central integrating mechanisms of an organization. The more complex the tasks of the organization, the more open timely and distortion free should be the communication. Flight operations and aircraft maintenance are complex reciprocating tasks which require a constant information flow between CO, Operations Officer, Safety Officer and Maintenance Officer. Communication processes would be greatly improved which would in turn improve the readiness and efficiency of the squadron if these three key parties were connected to a local area network. The use of data base files within the maintenance department itself could facilitate the accurate timely flow of aircraft status information from the functional shops to central maintenance control.

Control processes, both those aimed at catching errors, and those that collect problem solving information, (The kind of information which will enable the organization to learn from errors and make improvements.), can be made real time and more accurate through the technology transfer afforded by microcomputers. Quality assurance reports that are vital for safe flight operations are delayed by the present message traffic format. Phase maintenance data bases could provide information needed to make necessary adjustments on part requisitions thus avoiding future availability problems.

The characteristics of communications, such as openness, distortion, time lag, and how these are related to computer networks needs to be addressed. How decision making is handled by personnel, that is, degree of participation, how systematic, how flexible, and whether it can be enhanced or changed with the proper use of modern office technology for the betterment of the organization is the most important aspect to be taken into consideration when designing new information systems technology.

Fitting people to roles, specifying performance criteria for roles, and measuring performance are the minimum measures required for process control to affect the technical subsystem. Standards and guidelines need to be established to regulate personnel selection and re-assignment in the information systems area. Computer qualification should be required of personnel shortly after placement in the job. Similar criteria should measure follow-on performance. When these qualifications are lacking, personnel should be made to pursue educational opportunities (This can be made part of the reward and punishment system.) such as technical literature, public domain tutorials, vocational training programs, Marine Corps Institute (MCI) courses, college evening classes and unive sity extension courses (The Naval Postgraduate School is a good source). Staffing and development to fill both present and future roles, and developing information and planning systems to support strategy and tasks are on- going technical processes. Unless a structured computer educational program is established Marine Corps-wide to formalize all marines in information systems/computer technology, the 4th MAW will continue to be understaffed for lack of qualified personnel. The political subsystem will have the greatest affect on the successful implementation and utilization of modern office technology. Managing who gets ahead and how, (succession politics) who gets what and how (decision and administration of the reward system), and who is appraised by whom and how (politics of appraisal) are the political processes which control and direct the organization through its people.

I. EMERGENT NETWORKS

The culture of the Marine Corps has many aspects or subcultures intertwined throughout. The computer subculture and the idea of technology transfer need to be other aspects taught from basic training and carried throughout a marines career. Selection of the right people for the departments utilizing modern office technology will build or reinforce culture. Management of rewards and management of information and planning systems to shape and reinforce the culture are important processes affecting the cultural subsystem.

Emergent networks are the structure and processes which, although not planned or formally prescribed, inevitably emerge in the organization. These networks of relationships and processes emerge because individual marines tend to interpret the mission differently. They may try to change the prescribed organizational process to facilitate their own job, thus abusing, altering, or ignoring new technology. As a result, a new set of unplanned and often unanticipated structures and processes emerge. These emergent networks may either help or hinder the accomplishment of the organizations mission. However, they are necessary in the organization to accomplish the work. A group of administrative clerks from each department may emerge to form a task relevant user network of word processing typists. Using the Zenith 150 system as a personal word processor can tie up the equipment for spreadsheet and data base use. Although the department will benefit from word processing, greater efficiency and effectiveness could be gained by using the system to the fullest extent of its design. The geographically dispersed structure of the 4th MAW is not conducive to the formation of organization wide emergent networks, however, with proper guidance from the headquarters elements emergent networks can be effective in the local level. Fostering the development of information returns which facilitate task accomplishment will steer the technical subsystem toward efficiency and effectiveness.

The political system will be affected by the management of emergent influence networks, coalitions, and cliques. Finally the cultural system can be ameliorated by fostering friendships and effective networks to shape and reinforce the culture. In this situation user groups which can benefit from "lessons learned" sessions and technical training lectures must emerge and continue to be fostered by a technological culture. Various configurations of networks may be more or less effective in task accomplishment.

J. OUTPUT

Efficiency of operations, combat readiness of men and materiel, and the morale of the individual marines in the organization are the major outputs of the 4th MAW. The organizations´ performance over time and in comparison to other commands which have incorporated office automation and comparable systems must be measured to determine levels of effectiveness. Do I.G. inspections show an increase in combat readiness and if so is it due to office automation and technical transfer? What is the satisfaction level of individuals using the microcomputer systems as compared to those on manual systems? Is modern office technology causing more dissatisfaction than the former system or are marines anxious to obtain and utilize even more microcomputers and advanced technology? A final performance measure is how the 4th MAW integrates man and machine and creates an environment which is conducive to reinlistments and extended officer commitments. Fear of new technology due to lack of training has forced pilots to shy away from A/C with technological advancements and eventually quit military flying. Fear of micro computer technology can discourage a whole generation of marines who are forced to utilize office automation form ever reinlisting.

VI. ALTERNATIVES WITHIN THE 4TH MAW

A. COMPUTER COMMUNICATION WITHIN THE 4TH MAW

As computer technology progresses, the area of computer communications has received much attention. Research shows over 90% of the people that responded within the 4th Marine Aircraft Wing expressed a desire to communicate with other sections, groups or other parent organizations. This improvement in office automation can enhance the quality of work. It can facilitate the accessing and changing of information and simplify the analysis and synthesis of data. The current 4th MAW computer environment consists of stand alone IBM compatible Zenith 150 microcomputers. Although these systems meet the basic requirements for most organizations of the 4th MAW, enhanced office automation capabilities can improve the quality of the work environment within specfic 4th MAW units. The advancements in communication techniques will reduce costs while increasing efficiency, accuracy and speed.

Survey results indicate a strong interest to communicate both internally and externally. Further discussion will identify the applicability of the use of a LAN for areas less than 1000 meters and the use of a modem for long distance communications. Figure 6.1 is a depiction of the results of question 34 of the Modern Office Technology Survey.

UNIT	LOCATION	RESPONSE QUANTITY	NO	YES	IN SECT	IN/OUT GROUP	IN/OUT 4TH MAW
MAG-42	Alameda	5	0	5	1	1/1	3/1
MAG-41A	Andrews	1	0	1	0	0/1	1/1
MACS-23	Aurora	2	1	1	0	1/1	1/1
MAG-46B	Bellechase	0					
MAG-42A	Cecil Field	1	0	1	0	0/1	0/0
H&MS-49B	Cherry Point	3	0	3	0	2/2	2/1
MAG-41	Dallas	1	0	1	0	0/0	0/0
MACS-24	Dam Neck	1	0	1	1	0/0	0/0
MAG-46	El Toro	5	1	4	0	0/1	1/0
4th LAAM	Fresno	10	0	10	2	1/2	4/1
MACG-48	Glenview	1	0	1	0	0/0	0/1
WES 47-	Greenbay	4	2	2	0	2/0	2/0
4th LAAM-B	Hayward	2	0	2	1	0/0	1/0
MAG-41B	Marietta	0					
MAG-42B	Memphis	0					
MAG-46A	Norfolk	5	2	3	0	0/0	2/0
4th LAAM-A	Pasedena	1	0	1	0	0/0	0/0
MWSG-47	Philadelphia	1	0	1	0	1/1	1/1
MWSG-47	Selfridge	6	0	6	1	3/2	4/2
MAG-49A	South Wey	5	0	5	2	3/4	4/4
MWSG-47A	Twin Cities	7	0	7	0	0/0	0/0
MAG-42C	Whidbey	4	0	4	2	1/2	4/3
MAG-49	Willow Grove	4	1	3	1	1/3	3/1
HQSQDN-47C	Wyoming	1	0	1	0	0/1	1/1

Figure 6.1 Survey Communication Response Data

B. LOCAL AREA NETWORK

This section intends to draw attention to considerations which influence the implementation and use of LAN´s to support specific units within 4th MAW.

1. LAN a viable alternative?

Organizations within the 4th MAW will be facing a significant problem - that of obtaining shared data access to specific information generated by squadron, group or wing organizations. Much of the data generated is mainly used within local surroundings. Far too often generated information will take several days before it is disseminated. Frequently this information arrives hours before or just after it is required by the section. This situation frequently causes equipment to be degraded or reports to arrive late or responsibilities being performed without full knowledge of the task. In an era of rapid expanding computer technology, local area networks will become common place. LAN´s will be needed to maintain effective and efficient communications within the working office environment of the future.

Within the U.S. Marine Corps, LAN systems are likely to become a major part of OA. The proliferation of smaller computers within the 4th MAW used for distributed processing will increase the need for an establishment of communications systems to aid in data exchange and application access.

2. What is a local area network?

> A local area network is a group of personal computers located in the same general area - one building, or one floor of a large buiding - connected by a common cable and running the same network program. The network program moves files back and forth among the computers in the network. When you print a file on the network printer, it is the network program that locates the files and sends it to the computer to which the network printer is attached, there, the network printer stores the file on disk and prints it when the printer is available [Ref.18].

Another shorter definition describes the Local Area Network:

> Local Area Networks allow a great number and variety of machines large amounts of information at high speeds over limited distances [Ref. 19].

3. Using a LAN

A LAN has the ability to interconnect multiple workstations and systems at the local level. This allows for resource sharing, adaptability to changing environments, increased user productivity, information exchange, and improved administrative coordination. The LAN is one of many potential solutions to office communication problems. No single LAN architecture will be right for every unit. The LAN can specifically increase productivity for units such as MAG-42, MAG-41, MAG-46, 4TH LAAM BN and MAG-49 in the following areas: mobilization coordination, operational/logistical cooperation, maintenance/supply parts verification and auditing, and fiscal data updates. Appendix D identifies additional USES associated with the employment of a LAN.

POTENTIAL BENEFITS INCLUDE THE ABILITY TO:

* interconnect the IBM compatible Zenith 150 computer
* exchange data between systems(inter/intra unit)
* provide back-up in real time applications
* share computer peripheral resouces
* improve reliability, availability, and survivability
* allow a single terminal to access multiple systems

- provide flexibility of equipment locations
- integrate data processing and office automation
- allow management to access informaton in a timely and creative manner
- obtain and provide services

POTENTIAL PITFALLS:

- Distributed databases raise problems of data integrity and security/privacy
- Creeping escalation occurs, more equipment is purchased than is actually required
- Loss of control, more difficult to manage and enforce standards
- Interoperability of software is not guaranteed
- NOT all organizations require the use of a LAN even though desired

POTENTIAL USES FOR 4TH MAW UNITS:

- Administration/Recruiting/Operation/Supply/Training
- Maintenance/Supply/Embarkation/Mobilization
- MMO/Maintenance/Motor Transport/Embarkation/Supply
- S-1/S-2/S-3/S-4/XO
- Group to Squadron communications

4. Selecting a LAN

In selecting a specific LAN technology the individual 4th MAW unit must assure that the network is both workable and cost effective. The solution should meet the present and future operational needs of the your organization. In this analysis the 4th MAW Information System Officer must assist in the evaluation of the LAN with regard to each of the following technological parameters:

- Transmission techniques-the way the electrical signals are carried over the network (i.e., analog or digital, baseband or broadband systems).
- Meduim - the type of cable used to carry the communication signals (i.e., twisted pair, coaxial cable, or fiber optics).
- Topology - the geometry of the layout of media in the organization (i.e., star, ring, bus, or tree).
- Access protocol-the method each station uses to gain access inorder to transmit information (i.e., centralized distributed, circuit switching, polling, token passing, or carrier sense multiple access/collision detected).

The analysis and selection of these four parameters will define the LAN´s cost, performance, maximum communication distance, reliability and availablity, and growth potential.

Selecting a LAN for a section, squadron, group or headquarters level must not be taken lightly. Most installations which fall short in the LAN implementation process, do so because of lack of planning, training and integration time. Any network success is directly dependent upon the attitude and approach of the people involved with the purchase and installation [Ref. 20].

5. Configuration alternatives

Figures 6.2 thru 6.4 are examples of alternative network configurations. Not all topologies can have all control/access strategies needed by 4th MAW organizations, therefore, further coordination can be acquired from IBM for their PC Net, Token Ring, and Token Bus networks. Many vendors have similar philosophies but IBM is a forerunner within the LAN area and will provide much needed assistance and leadership throughout this endeavor.

C. LONG DISTANCE COMMUNICATION

Using a modem for long distance communication is an excellent, accurate, timely and economic approach to sending information. The survey results indicate that 76% of the respondants own a modem and that less than half use it. The 4th MAW modem utilization based on survey responses is identified below.

- 8% use a modem for message traffic
- 23% use a modem for general information
- 44% own a modem but do not use it
- 24% do not possess a modem

1. Definition of a modem (Modulator/Demodulator)

A modem converts a series of binary value voltage pulses into an analog signal by modulating a carrier frequency. The resulting signal occupies a certain spectrum of frequency centered about the carrier and is then propagated over voice grade telephone lines. At the receiver position, the modem demodulates the signal to recover the original data. [Ref. 21]

The only equipment required besides the computer is a modem (1200/2400 baud) and communication software.

2. Benefits

- Fast, timely, accurate transfer of data
- No added maintenance costs, and only inexpensive modem software, and a standard phone system are required
- An economic method to enable all sites electronic information access
- Information after receipt can be altered
- Transfer information even though computer are not compatible
- Improves productivity within the office automation environment

3. Modems in the 4th MAW

Several commands have use the modem to communicate with other agencies. The modem enabled MAG-49A to access information from NARDAC Norfolk. They obtained a program for OPTAR, for Log Line Item Consumption Documents, and for Correspondance Control Tracking System (MCCS).

More than half of the surveys received indicate little or no modem usage. Effective procedures to implement modem utilization should be developed and disseminated to all commands. Apparently this valuable and inexpensive piece of equipment has not been utilized to it´s full potential. Within the 4th MAW organization the modem is an overlooked resource that can save time, money and improve communication amongst the commands.

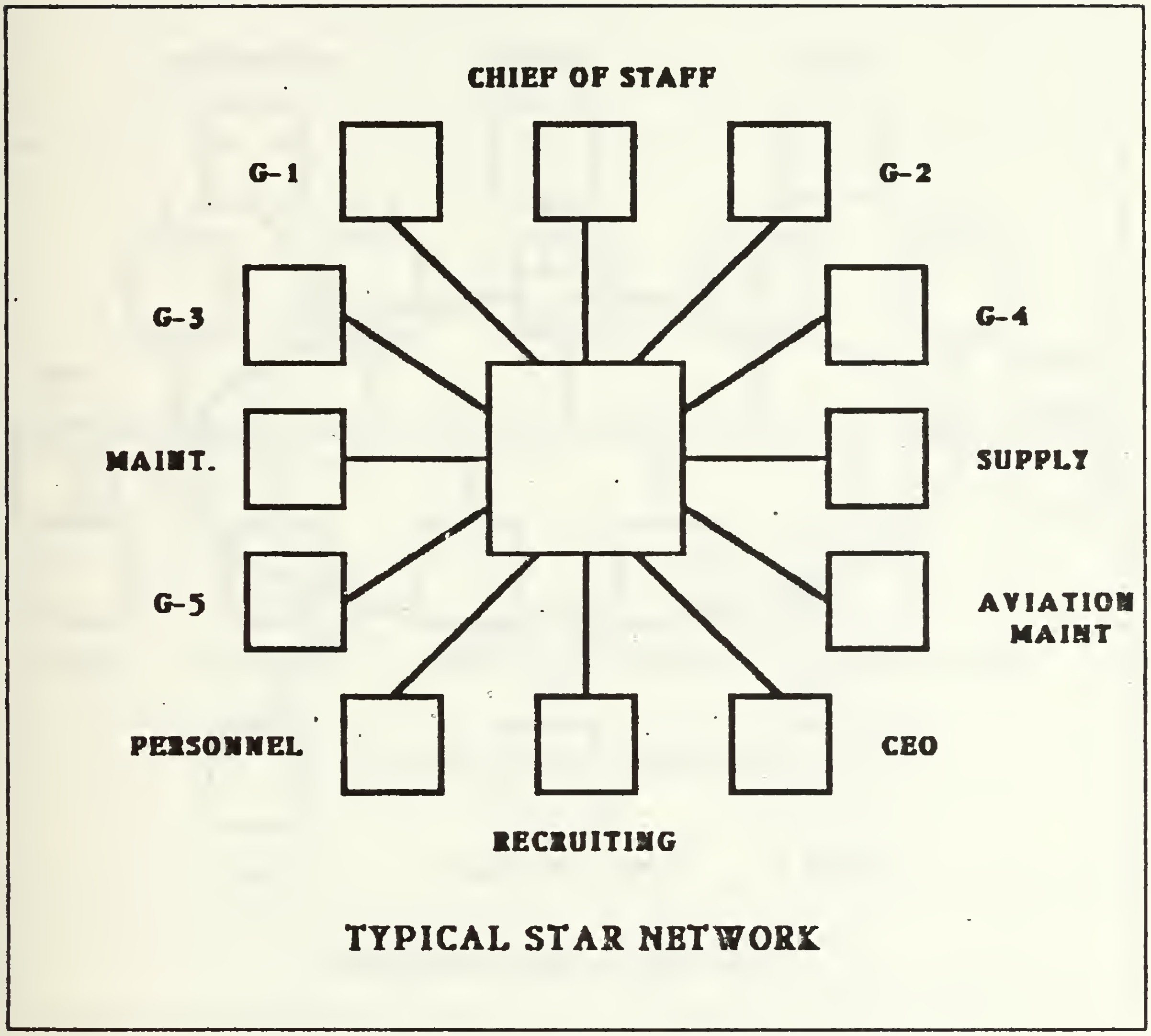

CHIEF OF STAFF
G-1
G-2
G-3
G-4
MAINT.
SUPPLY
G-5
AVIATION MAINT
PERSONNEL
CEO
RECRUITING
TYPICAL STAR NETWORK

Figure 6.2 Typical Star Topology

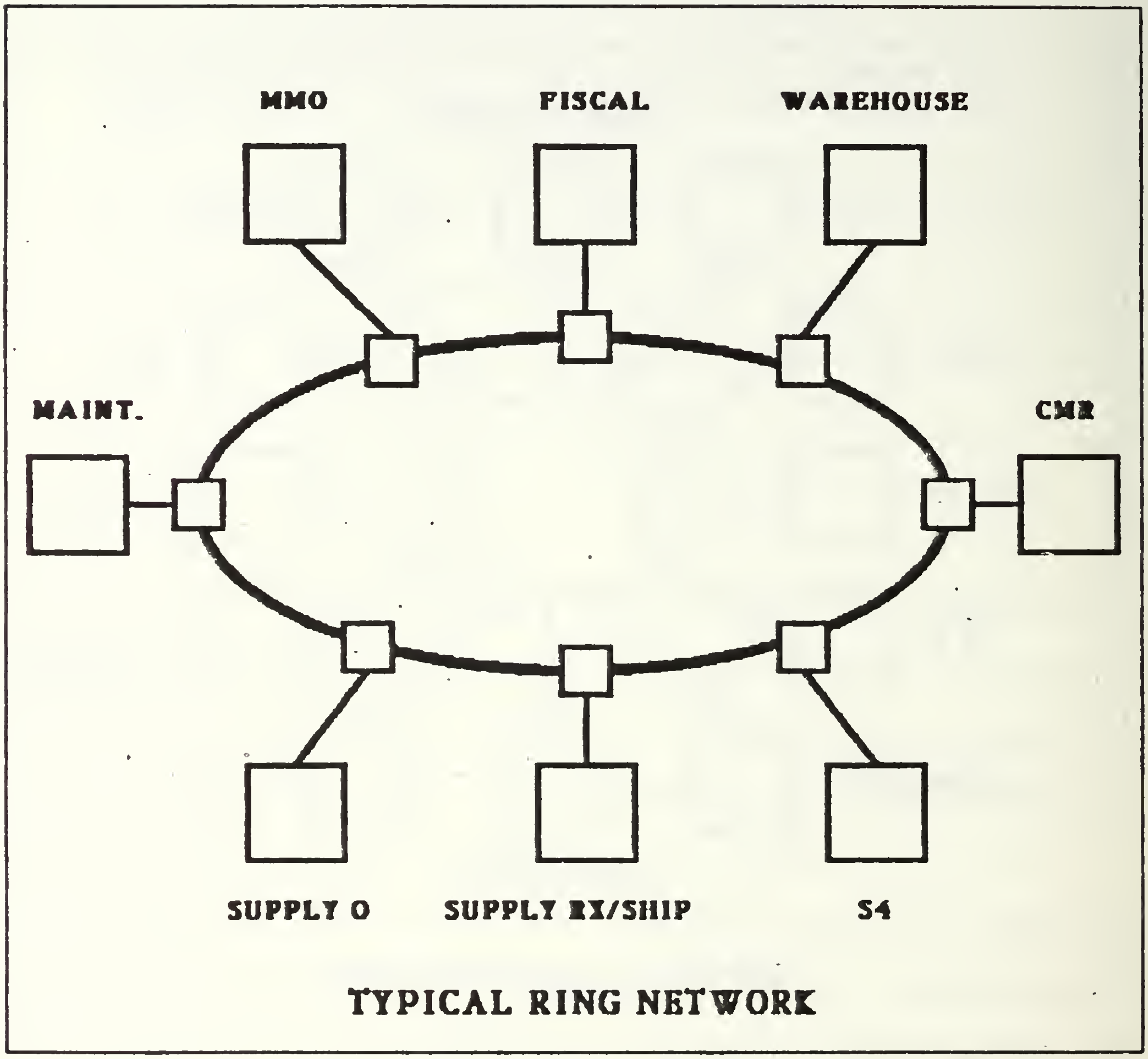

MMO
FISCAL
WAREHOUSE
MAINT.
CMR
SUPPLY O
SUPPLY RX/SHIP
S4
TYPICAL RING NETWORK

Figure 6.3 Typical Ring Topology

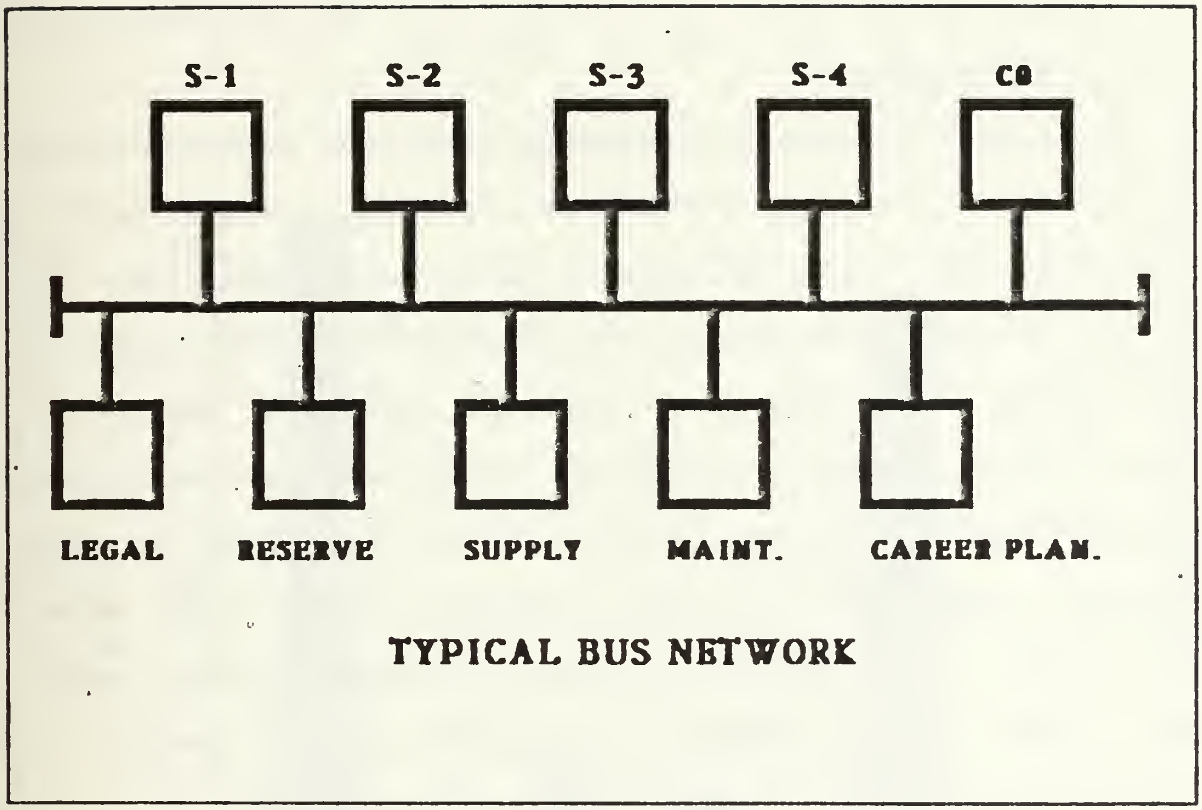

S-1
S-2
S-3
S-4
CO
LEGAL
RESERVE
SUPPLY
MAINT.
CAREER PLAN.
TYPICAL BUS NETWORK

Figure 6.4 Typical Bus Topology

D. SOFTWARE LANGUAGES

> My biggest complaint has been: Here´s the computer and software - now do your thing. I feel it would have been better if the proper authority had tailored the software for us because they have the expertise. I´ve spent numerous hours tailoring the software, just imagine the number of manhours spent duplicating the same task.
>
> Survey Respondant

1. Introduction

A system process originates with an identification of a need and the establishment of specific requirements. Throughout our research numerous units have identified the desire to use the Zenith 150 but comment on the lack of experience, knowledge and software programs available. Interestingly enough, the usage constraint is not the capability of the system, but the lack of available software programs applicable to the mission of the 4th MAW. Distribution of commercial software packages such as Multimate, SuperCalc and Dbase II are useful but not nearly as sufficient as receiving mission oriented software.

2. Requirements

Research indicates that two extremes are common; first the marines responsible for the equipment either resist new technology or are the only personnel familiar with the data manipulation and equipment operation. A committment to support the Zenith 150 must be emphasized. A mere action to purchase tutorial language packages is a step in the right direction but is only the beginning. A complete and dedicated committment must be made in order for the equipment to be used to its maximum potential.

The two languages with which 4th MAW marines are most familiar are basic and database. Figure 6.5 depicts the frequency usage of the six common languages in the 4th MAW.

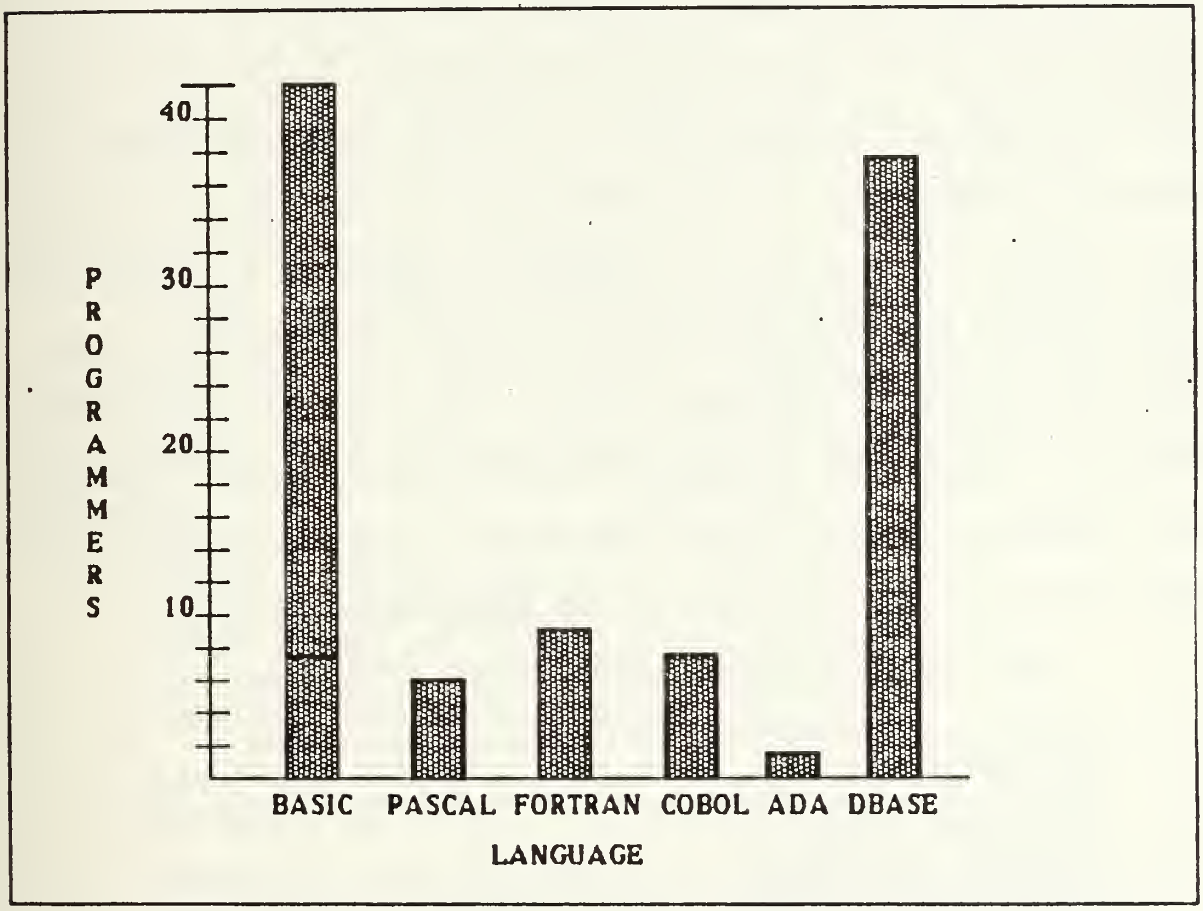


Figure 6.5 4th Program Language Familiarity

Marine Corps sponsored software programs are not being developed for the Zenith 150. The FMF-EUCE supportable software will probably not be available until 1989.

The use of dbaseII/III/IIIplus is a viable alternative to support operational and administrative requirements such as, aircraft phase maintenance, training systems, administrative processing, recruiting and retention, and supply and logistical tasking. The main advantage of the dbase language is that it provides simplicity in application programming and requires limited programming experience. Another important advantage of dbase processing is the elimination or reduction of data duplication. The internal language of dbase is a structured language and its programs are far easier to write and update than unstructured programs. [Ref. 21] Additionally, this internal language is extremely powerful with single commands for indexing, sorting and reporting. Often programs are many times faster than basic language programs.

Some typical dbase applications include:

* Inventory, accounts receivable/payable, and job costing
* Purchase order systems
* Invoicing systems
* Project management
* Order entry systems

Some excellent features of dbase are:

- Easy data structure manipulation
- Data can easily added, edited, deleted and sorted
- Reports easily created
- Easy screen designing
- Easier program developement
- Better data management

Until mission specfic software programs are developed and distributed to support the units of the 4th MAW, alternative methods must be pursued. There are many sources of information, literature and software programs from civilian and military organizations that can be used or easily modified to perform a needed function. Many of these programs are written in basic and dbase language and can be modified or used as designed.

The following is a brief source list from which personnel will be able to obtain information on computer literature, and military/commercial public domain software programs:

(a) Military Public Domain
C2MUG SOftware Catalog
Chief CECOM, MCD (Attn: Amsel, Fl, MCD)
Ft Leavonworth, K.S. 66027-5600
Call for catalog at autovon 552-7550

(b) Naval Postgraduate School Computer Club
Monterey, Ca. 93943

Membership fee required, public domain software available in CPM and MSDOS. Many of the software programs can be modified or used as designed.

(c) Computer Decisions; A magazine for MIS executives
Hayden Publishing Company Inc., 10 Mulholland Dr,
Hasbrouck Heights, N.J. 07604 (subscription fee)

Purpose is to help MIS exectives make strong contributions to the effectiveness, productivity and survivability of the organization.

(d) Government Computer News;The paper serving computer users throughout federal government. Ziff-Davis publishing Co., One Park Avenue, N.Y.,N.Y. 10016.

Published bi-weekly. Free subscriptions to qualified applicants. Newspaper format. Covers news, procurement, software, office automation with multiple articles and updates in each subject. Most articles relate to federal laws, spending, plans, new products and development strategies.

(e) The Government Micro User´s Catalog; Technology Services Guide to Better Computering. Technology Services Inc., 14130-B Sullyfield Circle, Chantilly Va. 22021.

Includes listings for software, hardware, peripherals and add-ons, books and training. All products have order numbers and GSA prices.

(f) NARDAC, Norfolk, Oakland, and San Diego, most NARDAC´s publish quarterly magazines, Norfolk´s magazine is titled "Chips Ahoy". They maintain an electronic bullentin board to share data and program resources.

E. TRAINING IN THE 4TH MAW

Research findings indicate a tremendous interest for more taining from all responding sites. It must be realized that almost all users are initially willing to give a new system ample opportunity to prove itself worthy, if it continues to frustrate them, the result will be reduced productivity [Ref. 21]. Positive user attitude, enhanced by well planned implementation contributes significantly to system performance and user ability. The addition of the FMF EUCE should help improve the units productivity.

However, unless effective training is implemented, thousands of dollars worth of computer equipment will continue to be under utilized and maximum productivity will not be experienced.

Users within the 4th MAW include those who interact directly with the computer, those who supply data to the system and others who use the reports and documents it may generate. All these individuals need to be aware of the importance of their role and the way they are effected by the system. A viable training program should be developed to optimize computer productivity and to assist in manipulating data. The following training items should be considered for implementation:

- Minimum competency standards required before working on data.
- Learn the logical description of how the system can assist the marine or manager.
- Establish a library of video tape course recordings.
- Establish a program for computer assisted instruction programs.
- Design a training program for beginners.
- Design a program for experienced users to include software developement.
- Implement a vocational training program for reserve personnel.
- Establish, maintain and evaluate regular computer training sessions.
- Hold frequent brainstorming sessions to reinforce and exchange ideas.

* Require assessment of training and performance.

* Provide marines the oppuntunity to take programming courses

* Provide task force type assistance.

* Establish team assignments for problem areas on the group/squardon level.

Training is a critical part of the success of a system. Research strongly indicates that training would not only enhance productivity but also improve the confidence level of individual marines.

Larger commands should explore the possibility of bringing an instructor into the facility. Although it may appear attractive and economical to send one person to a class and then have that person return and teach the rest of the group, it is too much to ask that a person become an expert after several periods of instruction. Training is extremely important. Since it is so critical to successful operations. Computer instruction should be addressed to personnel of equal knowledge and or programming skills. This will result in better class participation and interaction. After a training program has been developed a realistic and relatively brief analysis of the training program should be performed to determine cost effectiveness. Criteria is not limited to, but should include; course fee, transportation and billeting expenses, cost of on the job time lost, improved productivity, enhanced morale and additional skills obtained.

Training is essential to the approach marines take regarding computer utilization. The FMF EUCE program is an excellent example of how a sound information system training program should be outlined. The FMF EUCE program is planning to include manuals, FMF EUCE software, both initial and follow on training, software application´s training by the function sponsors, tutorials in word processing, spreadsheets, dbase and graphics, classroom lectures, practical exercises and hands on application for the inexperienced. Until the FMF EUCE project is implemented the personnel of 4th MAW must begin to initiate and maintain their own training program. As previously stated, purchasing computer aided instruction (CAI) tutorials is just not enough.

VII. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

Technological advancements in weapons systems and an increased tempo of operations has created a need for faster and more accurate information processing techniques within the 4th MAW. The Zenith 150 microcomputer was purchased to remedy some of these problems. A review of the implementation program indicates shortcomings in the over all systems design process which should include not only hardware but people, procedures, programs and software.

Technological change is starting to make previously valid organizational structures for information processing obsolescent. These changes will eventually force reorganization for reasons of both efficiency and effectiveness. Microcomputer information processing must become part of a larger office automation system to include integrated data and voice communications. The present 4th MAW organization includes neither the staff levels nor the mix of skills necessary to capitalize on this new technology. Information systems technologies which are new to the organization require quite different managerial approaches than those technologies which the 4th MAW has had more experience with. Where the data and computer hardware resources should be located organizationally also requires rethinking.

B. RECOMMENDATIONS

Command involvement, training, technology transfer coordination, LAN/modem application and implementation and software language application and development are the major areas in which changes are recommended.

1. Command Involvement

Computers are now an integral part of the 4th MAW´s operational and administrative responsibilities. To maintain an effective knowledge base of technical equipment and new application software packages the unit commander must develop and implement programs, procedures and policies which will support the effective use of the Zenith 150 microcomputer. The commander or the information systems manager (as a primary duty) must establish an on going training program focusing on the individual, operational capabilities, program development, and effective computer usage. Command involvement must be present before optimum productivity and enhanced morale can be realized.

2. Training

The operation and control procedures now being used in the 4th MAW´s administrative systems program will have to be expanded to accommodate the changes brought about by the arrival of the microcomputer. These improvements will be needed to modernize the manner in which units perform administrative responsibilities. Units should pursue educational training from sources such a the Marine Corps Development and Education Command, NARDAC´s, and the other sources previously mentioned. Computer literacy training should emphasize microcomputer operation, use of fourth generation programming languages, and socio-technical techniques for office automation. Training remains the weakest link in the 4th MAW information systems development program. The initiation of a Marine Corps wide computer education program is necessary for further technological advancement to take place . As long as computer training and education programs remain secondary priorities the enhanced productivity and effectiveness which is attainable through the use of microcomputer information systems will not be realized.

3. Technology Transfer Coordination

Several of the organizations within the 4th MAW are unable to develop small to medium sized software programs and rely on outside organizations for software development. The 4th MAW Information Systems Management Office should act as a technology transfer cell of approved programs, software development assistance, and current information updates that will be disseminated to support aviation and aviation-ground type organizations. This office should also have its responsibilities expanded and be staffed with more trained personnel to better support the mission.

4. Software Language Application and Development

Operational administrative requirements and managerial decision support needs can be met by using the Zenith 150 in conjunction with existent information processors. Much of the software needed is inexpensive and frequently obtained from other military organizations. Basic and DBase language programs, military public domain software, and modem communications programs are feasible approaches to more efficient computer utilization.

Marine Corps sponsored mission specific software applications generally remain unavailable for the Zenith 150 microcomputer. Software program development and coordination must be pursued. The majority of the personnel in 4th MAW who can program use basic and DBase languages. Standards should be developed in these languages so that all organizations can easily adapt to these program applications. Although several units have already communicated with outside agencies for software products, Headquarters 4th MAW could better support communication between units and outside agencies, so that program exchange and idea interaction can occur more often.

5. LAN/Modem Application and Implementation

Local Area Network technology for microcomputers is now more affordable and easier to implement. Although not all the units of 4th MAW should purchase a LAN, group and headquarters type organizations could receive many benefits from this expanding technology. Since all units of the 4th MAW have a modem to be used with the Zenith 150, these sites should be required to communicate with each other on a frequent and scheduled basis. This exercise could eventually expand to include the use of electronic mail or bulletin board throughout the organization.

This study has diagnosed the information system structure and implementation procedures used by the 4th MAW to incorporate the Zenith 150 microcomputer. An open systems model framework was used to discuss socio-technical design tools such as office automation and technical transfer. The recommendations are proposed change strategies for areas which were identified as potential trouble spots in the growth cycle of technological development. The conclusions drawn are based on pertinent historical data relating to success and failures in past information systems implementation attempts. There is conclusive evidence that at least part of these changes will have to occur in order to increase the efficiency and effectiveness of the already existent information systems implementation program within the 4th MAW.

APPENDIX A

MODERN OFFICE TECHNOLOGY SURVEY

PERSONAL DATA: Please answer the following questions:

1. Rank_____________

2. Age______________

3. Sex ☐ M or ☐ F

4. Educational Level ☐ High School
☐ College
☐ Other _____________
(i.e., trade school)

5. Time with Unit ____________________

6. Section Title ____________________

1. How many Zenith 150 computers are in your organizations´ possession?

A. ☐ 1-2 B. ☐ 3 C. ☐ 4 D. ☐ 5 or more E. ☐ not sure

2. What section´s / department´s are assigned a Zenith 150 computer?

A. ☐ S-1 B. ☐ S-2 C. ☐ S-3 D. ☐ S-4 E. ☐ Other

3. How many personnel are assigned to use the Zenith 150 computer.

A. ☐ 1-3 B. ☐ 3-10 C. ☐ 10-20 D. ☐ 20 or more

4. Of those personnel assigned to utilize the computer, how many are familiar with programming?

A. ☐ 0 B. ☐ 1-3 C. ☐ 4-10 D. ☐ 10-20 E. ☐ 20 >more

5. Of those familiar with computer programming, how many people can program in the following languages? (place quantity next to program title)

		1-2	3-4	5-6	7 or more
A.	☐ basic	☐	☐	☐	☐
B.	☐ pascal	☐	☐	☐	☐
C.	☐ fortran	☐	☐	☐	☐
D.	☐ cobol	☐	☐	☐	☐
E.	☐ ada	☐	☐	☐	☐
F.	☐ dbase	☐	☐	☐	☐
G.	☐ zero knowledge				

6. How many hours of formal training did your assigned personnel receive prior to operating the Zenith 150 computer?

A. ☐ 1-5 hours
B. ☐ 6-10
C. ☐ 11-15
D. ☐ 16 or more
E. ☐ not sure
F. ☐ zero

7. Did formal training consist of?

A. ☐ system operation
B. ☐ Multi-mate
C. ☐ Supercalc III
D. ☐ Dbase II
E. ☐ other

8. Are there any regular personnel presently attending computer/programming classes?

A. ☐ yes B. ☐ no

9. Has any formal computer systems training been set up or made available to your organization?

A. ☐ classes taught by software vendors?
B. ☐ classes taught by computer school instructors? (such as from Quantico Computer School)
C. ☐ classes taught by computer science graduates from Naval Post Graduate School?
D. ☐ other source
E. ☐ purchased tutorial for programs
F. ☐ none

10. Are you interested in receiving any computer technology instruction? (either civilian or military source)

A. ☐ yes B. ☐ no

11. If yes, in what area?

A. [ ] using software programming
B. [ ] programming
C. [ ] system operations
D. [ ] computer accessories
E. [ ] modem utilization
F. [ ] other

12. What is the major handicap while working with the Zenith 150.

A. [ ] poor typing skills
B. [ ] understanding and comprehension of technical user manuals.
C. [ ] operating procedures
D. [ ] use of software packages provided

13. Identify the problem areas experienced with the "Supercalc III" program.

A. [ ] understanding and comprehension of technical user manuals.
B. [ ] being able to apply (adapt) this software to your assigned mission.
C. [ ] Don´t use the programs
D. [ ] no problems

14. Identify the problem areas experienced with the "Multimate" program.

A. [ ] understanding and comprehension of technical user manuals.
B. [ ] being able to apply (adapt) this software to your assigned mission
C. [ ] don´t use the programs
D. [ ] no problems

15. Identify the problem areas experienced with the "Dbase II" program.

A. [ ] understanding and comprehension of technical user manuals.
B. [ ] being able to apply (adapt) this software to your assigned mission.
C. [ ] don´t use the programs
D. [ ] no problems

16. Are you using dbase as a relational tool? (A relation is a two dimensional matrix having several values that can be combined and manipulated with themselves and other relations.)

A. [] yes B. [] no C. [] don´t understand

17. Have you used Dbase II to develop ANY program that will assist you in one or more of the following areas?

A. [] yes B. [] no

If yes, check the area and describe the purpose.

C. [] inventory control
D. [] preventive maintenance scheduling
E. [] phase maintenance scheduling (aviation units)
F. [] administration of personnel
 (recruiting/retention)
G. [] not using Dbase II
H. [] other (please list)
I. [] recruiting/retention
J. [] operations
K. [] maintenance
L. [] supply
M. [] administration

(i.e., [x] operations; using Dbase for MCI, training, and ATD management.)

18. Do you use the computer to support:

A. [] tool control (inventory and ordering)
B. [] pre-expended bin
C. [] float
D. [] other
E. [] not applicable

19. Have you developed or are there any existing programs to assist you in flight planning? (i.e., fuel, distance, heading information for route cards)

A. [] yes B. [] no

20. How many personnel in your unit, own a personal computer?

A. ☐ 0 B. ☐ 1-5 C. ☐ 6-10 D. ☐ 11-15 E. ☐ 16 or more

21. Have you developed or are there any existing programs to assist you in any of the following areas?

A. ☐ tracking high times
B. ☐ aircraft daily status report formats
C. ☐ update flight hours
D. ☐ none
E. ☐ not applicable

22. How many personnel in your unit use their own computer to support their job responsibilities?

A. ☐ 1-5 B. ☐ 6-10 C. ☐ 11-15 D. ☐ 16 or more E. ☐ none

23. Does your organization own a modem?

A. ☐ yes B. ☐ no

24. In what capacity do you utilize the modem?

A. ☐ message traffic
B. ☐ general information
C. ☐ we own one but don´t use it
D. ☐ don´t own one

25. Aside from the software programs issued by Wing Headquarters, has your organization purchased or received any programs that are tailored to your own needs?

A. ☐ yes B. ☐ no C. ☐ don´t know

26. If yes please list software title and purpose.
(i.e., word perfect 4.1 - word processing)
Please comment:

27. Is there any area within your organization that you feel could be better supported by a software program?

A. ☐ yes B. ☐ no

If so, where? Please comment:

28. Do you have adequate computers to support your units mission?

A. ☐ yes B. ☐ no

29. Do you feel your organization has reached a point of computer saturation?

A. ☐ yes B. ☐ no

30. Do you feel that further expansion of computers while in a garrison environment will degrade the performance of your organization in a tactical environment?

A. ☐ yes B. ☐ no

31. Do you feel that the computer (Zenith 150) is improving your section´s productivity?

A. ☐ yes B. ☐ no ☐ section title______________

32. To what extent do you feel the computer age has generated many unnecessary and useless reports?

A. ☐ not at all B. ☐ very little
C. ☐ average D. ☐ great extent

33. Do you have confidence that computers can do your job/task more effectively than using the previous manual system?

A. ☐ yes B. ☐ no

34. Would you desire to communicate with other Marine Corps sites via the Zenith 150?

A. ☐ yes
B. ☐ no
C. ☐ within local structure, internal and external of your section
D. ☐ within your Group structure (other squadrons)
E. ☐ within other Groups of 4th MAW
F. ☐ within 4th MAW headquarters
G. ☐ outside the 4th MAW structure

35. In what area would you desire programs/software to be developed?

Please list area:

APPENDIX B

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**This is a SAMPLE program ONLY-it is not sponsored by the Navy Department and any resemblence to an actual Marine Squadron is coincidental.

1 PRELIMINARY INFORMATION:

1.0 INTRODUCTION:

This User´s Manual is designed to assist the MARINE maintenance administration personnel to update his A-6 type aircraft maintenance records. This manual is not designed to replace a programmer´s guide.

1.1 Purpose of AIRCRAFT STATUS REPORT:

This report will summarize the maintenance phase status of Squardon A-6 aircraft.

Sample Information:

ACFT BUNO	CURRENT PHASE	HOURS TO NEXT PHASE
1591780	Delta	0
1618190	Alpha	0
1556890	None	43

If the hours to next phase is 0 the aircraft is in phase or has exceeded phase time and has not been put into phase. If the number of total aircraft hours typed in is less than the previous phase an error will (****) occur in the hours to next phase column.

1.2 Purpose of MAINTENANCE PART STATUS REPORTS:

Allows maintenance officer to hold flight hours in abeyance to adjust for lack of parts. Directs supply officer to check on hand, on order and what to put on order according to the particular phases coming due.

1.3 Purpose of AIRCRAFT STATUS TRANSACTION:

This portion will discuss all transactions related to the A-6 aircraft. Sample transactions will include add / delete aircraft, updates and editing of records.

1.4 Purpose of MAINTENANCE PHASE TRANSACTION:

This portion will discuss the four types of phases, 16 system checks and numerous checks related to each system check. You will be able to add, delete, edit phase information.

1.5 Purpose of MAINTENANCE PARTS TRANSACTION:

This portion will discuss parts required in preventive maintenance on the A-6 aircraft. Sample transactions will include add / delete / edit part information, stock number (NIIN), nomenclature, qty on hand / order and reorder point.

1.6 Purpose of FUTURE (10 HOUR) MAINTENANCE REPORT:

This report flags all aircraft within 10 hours of the next phase and shows which phase is coming due.

1.7 Purpose of PHASE / CHECK MISC. LISTINGS:

This portion identifies miscellaneous reports concerning systems associated with a phase, checks associated with a system, parts associated with a check and checks associated with a part.

1.8 COMMENTS ON PROCEDURES AND COMMANDS:

Unless otherwise directed all commands and procedures are DBase III related. Please refer to DBase text for definitions and other reference information.

2 USING MAG 69

2.0 INTRODUCTION

MAG - 69 is a data base system that will track phase maintenance actions on A-6 aircraft for a MARINE ATTACK GROUP. The system will include data base files such as spare parts, maintenance actions, aircraft history. The program will track preventive maintenance of each aircraft and prepare associated reports to assist the maintenance personnel with timely analysis and repair.

2.01 Procedures:

1. Place Operating System disk and activate system. Upon activation take Operating System disk out.
2. Put DBase III disk in drive A.
3. Put working "PROJECT" disk in drive B
4. Commands to perform;
    a. DBase (while in drive A - dbase III)
    b. type: set default to B
    c. type: Do MAG69 (no space between title)

2.1 I HAVE MAG69 ON MY SCREEN, NOW WHAT?:

```
=====================================================
"                                                   "
"                                                   "
"                  MARINE AIR WING 69               "
"                                                   "
"        AIRCRAFT PHASE MAINTENANCE TRACKING SYSTEM "
"                                                   "
"                                                   "
"                Press any key to begin             "
"                                                   "
=====================================================
```

2.11 The MAG69 program was designed for the MARINE CORPS thus many tedious hours were needed to ensure the program to be "user friendly". Please follow the instructions on the screen. When in doubt refer to the user manual´s table of contents for assistance.

2.12 After pressing any key you will notice the options presented on the MAIN MENU. You will see:

```
====================================================
"                  MAIN MENU                        "
====================================================
"                                                   "
"    OPTIONS:                                       "
"  Print Reports:               File Maintenance:   "
"      1.  Print Daily AIRCRAFT STATUS Reports      "
"      2.  Print MAINTENANCE PART STATUS Reports    "
"      3.  Process AIRCRAFT STATUS Transactions     "
"      4.  Process MAINTENANCE PHASE Transaction    "
"      5.  Process MAINTENANCE PART Transaction     "
"      6.  Print FUTURE (10 Hour) MAINT Reports     "
"      7.  Print PHASE/CHECK Misc. Listings         "
"      8.  Read a GOOD (?) Joke                     "
"      9.  Quit - Return to DBase prompt            "
"                                                   "
"      WHICH OPTION? (number 1 to 8) :              "
"                                                   "
====================================================
```

2.13 If you´re unfamaliar with the 8 options presented in the main menu please refer to the preliminary information section so you can refresh yourself on what each option is all about.

2.2 SELECTING SUB-MENU´S:

Select an option from 1 to 8. Upon option selection please refer to the respective chapter you have just selected to proceed.

Since this organization is a relatively new company our Pres and Vice-Pres are eager to succeed thus will be available to answer any questions you may have. Remember we aim to please!!!

3 AIRCRAFT FILE

3.0 INTRODUCTION:

In this chapter we will discuss all transactions that effect the aircraft. Here you will be able to add / delete aircraft, update flight hours, update maintenance records and edit aircraft records.

3.01 In order to obtain the AIRCRAFT FILE SUB-MENU, perform the following commands.

a. type-Do MAG69
b. type-press any key to begin
c. select option "3" for aircraft file sub-menu

3.1 I have AIRCRAFT FILE on my screen, now what?

3.11 Aircraft file screen will appear upon selecting option "3".

```
======================================================
"              AIRCRAFT FILE SUB-MENU                 "
======================================================
"         OPTIONS:                                    "
"               1 UPDATE FLIGHT HOURS                 "
"               2 PLACE ACFT IN/OUT MAINT             "
"               3 ADD AIRCRAFT                        "
"               4 DELETE AIRCRAFT                     "
"               5 EDIT AIRCRAFT RECORD                "
"               6 QUIT, RETURN TO MAIN MENU           "
"           WHICH OPTION? (number 1 to 6):            "
"=====================================================
```

3.20 How to UPDATE FLIGHT HOURS.

3.21 The following screen will appear upon selecting option "1".

```
======================================================
"                 UPDATE FLIGHT HOURS                 "
======================================================
"                                                     "
"     ENTER INFORMATION BELOW:                        "
"                 AIRCRAFT BUNO:______                "
"                                                     "
"                 NEW TOTAL AIRCRAFT HOURS:_______    "
"                                                     "
======================================================
```

In the location where AIRCRAFT BUNO is, put the Bureau number of the aircraft (1 to 7 characters). This BUNO represents the number of the aircraft so ensure you have this data written down for future use. It will be needed throught - out the program for immediate reference.

Since each aircraft phase is determine by the quantity of hours an aircraft has been active, the New Total Aircraft Hours must be updated on a periodic bases. This is where you make the appropriate input. This total represents the NEW Total Aircraft Hours.

```
     Example        AIRCRAFT BUNO:  1591780
                    NEW TOTAL AIRCRAFT HRS:  2275
```

If an error has been made, follow instructions on screen to try again (answer Y)

If you desire to proceed back to AIRCRAFT FILE SUB-MENU type "N". To whom it may concern, I realize you are having a tremendous time, so let´s proceed to option 2. Before we do don´t let use stop you, go ahead and open up another nice cold Hamms.

3.3 How to UPDATE MAINTENANCE PHASE INFORMATION:

3.31 The following screen will appear upon selecting option "2".

```
======================================================
"        PLACE ACFT IN/OUT OF MAINTENANCE             "
======================================================
"                                                     "
"    ENTER INFORMATION BELOW:                         "
"                  AIRCRAFT BUNO:_______              "
"                  CURRENT PHASE:_______              "
"                                                     "
"     CHANGE MAINTENANCE PHASE OF THIS ACFT? (Y or N) "
"                                                     "
======================================================
```

3.32 The following catogories will require several inputs.

For AIRCRAFT BUNO: Input number of a/c. This information can be obtained from the AIRCRAFT STATUS REPORT. Upon entering BUNO no. the current information will appear. At this time input necessary changes to that specific a/c. To perform changes use arrow key or enter key for vertical movement.

Sample A/C BUNO	CURRENT PHASE
1591780	DELTA
1591810	NONE
1601200	NONE

3.4 How to ADD AIRCRAFT TO FILE:

3.41 The following screen will appear upon selecting option "3".

```
==================================================
"           ADD AIRCRAFT TO FILE                  "
==================================================
"                                                 "
"      ENTER INFORMATION BELOW:                   "
"                                                 "
"          AIRCRAFT BUNO:                         "
"          LAST PHASE (I.E., ALPHA):              "
"          CURRENT PHASE:                         "
"          HOURS LAST PHASE:                      "
"          HOURS NEXT PHASE:                      "
"          TOTAL AIRCRAFT HOURS:                  "
"                                                 "
==================================================
```

3.42 Adding an aircraft to file is used when a unit receives an aircraft from depot maintenance, rebuild or for temp - loan. In every case the aircraft received will be accompanied with a record book which will help you determine the a/c BUNO, LAST PHASE, HOURS LAST PHASE etc.. The information is critical to ensure the aircraft will be incorporated into the maintenance cycle.

The following definitions should help guide your input toward each category. Upon each input PRESS ENTER to move to the next catogory.

a. Aircraft BUNO: Aircraft registered identification number.

b. Last Phase (i.e., ALPHA): The maintenance phase the aircraft just left from. In this program there are only four phase A,B,C,D. This allow you to add additional phases, systems and checks as appropriate.

c. Hours Last Phase: The quantity of operational hours the aircraft had when inducted into the last phase.

d. Current Phase: The phase the aircraft is currently in (i.e., A,B,C,D or NONE). "NONE" means the aircraft is currently operational but has yet to reach a preventive maintenance phase to require system checks.

e. Hours Next Phase: The total opertional hours at which a directed phase is scheduled to take place. The maintenance officer/chief will have to direct you to place the a/c in phase. If the a/c is not put in phase in the phase file, the hours to next phase will continue to read the same. There is no automatic flag to change the hours by adding 35 or 50 hours when the a/c raises the flag. This feature is to protect the system if an a/c is late or early for a scheduled phase. You will be able to check hours past due by subtracting hours next phase from totla hours.

3.50 How to DELETE AIRCRAFT FROM FILE:

3.51 The following screen will appear upon selecting option "4".

```
=====================================================
"          DELETE AIRCRAFT FROM FILE                "
=====================================================
"                                                   "
"        ENTER INFORMATION BELOW:                   "
"                                                   "
"             AIRCRAFT BUNO:_______                 "
=====================================================
```

3.52 In order to delete an a/c from file, enter the a/c BUNO where the prompt is located. PRESS ENTER upon completion of input. To ensure you are selecting the correct aircraft to be deleted, you will be ask a question.

"SURE YOU WANT TO DO THIS? SELECT "Y" to delete. If you press enter instead of "Y" you will not delete the apprpriate record. You will be ask if you desire to delete another, if not select "N" or PRESS ENTER.

3.6 How to EDIT AN AIRCRAFT RECORD:

3.61 The following screen will appear upon selecting option "5".

```
=====================================================
"            EDIT AIRCRAFT FILE RECORD              "
=====================================================
"                                                   "
"    ENTER AIRCRAFT BUNO:                           "
"    ENTER CORRECTED INFORMATION BELOW (move cursor "
"      with arrow keys, when done, place cursor on  "
"      end.                                         "
"         LAST PHASE:                               "
"         CURRENT PHASE:                            "
"         HOURS LAST PHASE:                         "
"         HOURS NEXT PHASE:                         "
"         TOTAL AIRCRAFT HOURS:                     "
=====================================================
```

3.62 Follow instructions as indicated on screen above. If you do not recall title definitions please refer back to section 3.43.

3.63 In this section, input the aircraft BUNO of a/c you want to edit. Upon input of BUNO and pressing enter, utilize the arrow key to the location in which you desire to update. Upon completion of updates, use arrow key to move cursor to "END". You will have the opportunity if you desire to edit another record by selecting "Y". If you don´t want to edit an additional record PRESS ENTER or "N" to return back to the a/c file sub-menu. If finished PRESS

"6" to return to the MAIN MENU.

4 PHASE FILE

4.0 INTRODUCTION:

4.1 I have PHASE FILE on my screen, now what?

4.01 Phase file screen will appear upon selecting option "4" in the main menu. You will see:

```
=======================================================
"               PHASE FILE SUB - MENU                 "
=======================================================
"         OPTIONS:                                    "
"                1  ADD PHASES/CHECKS                 "
"                2  DELETE PHASES/CHECKS              "
"                3  EDIT PHASE INFO                   "
"                QUIT,  RETURN TO MAIN MENU           "
"                                                     "
"      WHICH OPTION?  (NUMBER 1 TO 4)                 "
=======================================================
```

4.2 How to ADD PHASES/CHECKS (select option 1).

```
=======================================================
"            ADD PHASES / CHECKS TO FILE              "
=======================================================
"                                                     "
"        ENTER INFORMATION BELOW:                     "
"             MAINTENANCE PHASES (ie ALPHA)______     "
"             SYSTEMS____________________________     "
"                                                     "
=======================================================
```

4.21 In order to obtain a list of phases, system checks and checks you must exit the MAG69 program. The following commands will guide you.

a. Upon program termination you will see a dot(.) within the DBase III program. Follow the provided instructions to obtain a phase / system listing.

1. at the (.)
2. type "use phases"
3. type "list"

Sample output os listed below:

```
  RECORD              TYPE               SYSTEM
    2                 ALPHA            CORROSION
    4                 ALPHA            FLIGHT CONTROLS
    8                 BRAVO            NAVIGATION EQUIPMENT
   10                 CHARLIE          FUEL SYSTEM
   13                 DELTA            POWER PLANTS
```

b. If you desire a list of checks related to systems checks follow the provided instructions to obtain information.

1. "." (In DBase)
2. type "use checks"
3. type "list"

Sample output listed below:

```
  RECORD NUMBER        SYSTEM                     CHECKS
```

4.22 If you used an existing phase and system check the following question will be on the screen.

"PHASE ALREADY IN FILE..WANT TO ADD CHECKS? (Y or N)

If you select "Y" the follow inputs should be made to add to existing phase/system checls. Name your new check and place where indicated.

CHECK:______________ Sample: UHF RADIO
CHECK NUMBER:_______ A782

If phase did not previously exist, upon input, it will added to the existing phase/system file.

4.3 How to DELETE PHASES/CHECKS (Select Option 2)

```
=======================================================
"       DELETE PHASES / CHECKS FROM FILE              "
=======================================================
"                                                     "
"      ENTER INFORMATION BELOW:                       "
"                                                     "
"              PHASE (i.e., ALPHA)________            "
"                                                     "
=======================================================
```

Upon making input, PRESS ENTER and you will be asked

"IS THIS THE CORRECT RECORD TO DELETE (Y or N): IF "Y" YOU WILL ASKED AGAIN."

"SURE YOU WANT TO DELETE THIS RECORD (Y or N):" IF "Y" THE PHASE WILL BE DELETED.

4.4 How to EDIT PHASE INFORMATION (Select Option 3)

```
========================================================
"          EDIT PHASES / CHECK RECORDS                 "
========================================================
"                                                      "
"    ENTER PHASE (i.e., ALPHA):____________            "
"    ENTER SYSTEM:_______________________              "
"    ENTER  CORRECTED INFO BELOW (move  cursor with    "
"         arrow keys, when done, place the cursor on   "
"         "END".                                       "
"                                                      "
"            PHASE:_________                           "
"            SYSTEM:_____________                      "
"                                                      "
========================================================
```

Just follow instructions, so input existing data to be modified on the top part of screen and new data on bottom part of screen. PRESS ENTER or move arrow key to "END" location to exit.

5 PARTS FILE

5.0 INTRODUCTION:

5.1 I have PARTS FILE on my screen, now what? (Select Option 5).

```
=======================================================
"            PARTS FILE SUB - MENU                    "
=======================================================
"                                                     "
"      OPTIONS:                                       "
"            1  RECEIVE, ISSUE, ORDER PARTS           "
"            2  ADD PARTS                             "
"            3  DELETE PARTS                          "
"            4  EDIT PARTS                            "
"            5  QUIT, RETURN TO MAIN MENU             "
"      WHICH OPTION?  (number 1 to 5)                 "
"                                                     "
=======================================================
```

5.2 How to update ORDER, RECEIVE, and ISSUE PART records (Select Option 1).

```
=======================================================
"       ORDER, RECEIVE, ISSUE PARTS                   "
=======================================================
"                                                     "
"      ENTER INFORMATION BELOW:                       "
"         PART STOCK NUMBER:______________            "
"                                                     "
=======================================================
```

5.21 In order to obtain a parts listing of all parts in the system follow procedures in section 4.12 except with the following modifications.

1. type - use parts
2. type - list

Sample output as listed below:

```
REC NO.     NIIN          NOMEN.    QTY O/H  QTY O/O  R/O PT
  1        00-051-1375  UNIV COUPLING
 50        00-477-6797  COMPASS CARD
180        01-986-2765  PROBE SWITCH
```

5.22 Upon proper input of data (ie 00-051-1375) the following question will appear. Select 1,2 or 3 only.

```
1)ORDER   2)RECEIVE  3)ISSUE  PARTS (NUMBER 1 TO 3):____
```

If you select "1" the following will appear:

"ORDER QUANTITY":____ Place the qty authorized to order. This information can be obtained from your Maint. Chief.

If you select "2" the following will appear.

"RECEIPT QUANTITY":____ The qty is verified by shipping documentation. Upon completion return to Maint Chief.

If you select "3" the following will appear.

"ISSUE QUANTITY":______ Upon completion ensure issued part is recorded in a/c log.

Upon input completion the following appears.

```
"STOCK NUMBER LOCATED.. QTY UPDATED.
     DO ANOTHER? (Y or N)"
```

5.3 How to ADD PARTS TO FILE (Select Option 2).

```
====================================================
"                ADD PART TO FILE                  "
====================================================
"                                                  "
"       ENTER INFORMATION BELOW:                   "
"            PART STOCK NUMBER (NIIN):             "
"            PART NOMENCLATURE:                    "
"            QTY ON HAND:       QTY ON ORDER:      "
"            REORDER POINT:                        "
"                                                  "
====================================================
```

This screen appears to be self-explanatory. This information will normally be given to you by the Maintenance Chief or Supply Chief. As you can notice the type information required is identical to the sample listed in section 5.21. After data input completed PRESS ENTER. The following will appear.

"THIS PART ALREADY IN FILE" OR

"IF THIS PART IS ASSOCIATED WITH OTHER CHECKS YOU MAY ENTER THOSE CHECKS NOW. DO IT (Y or N)"

If the part is a portion of a system check identify the check number where indicated.

"THIS PART ASSOCIATED WITH WHAT CHECK? (i.e., A309):_____

If puzzled on association use procedures in section 4.21 to identify checks.

Upon check identification, you will be asked again.

"THIS PART ASSOCIATED WITH ANOTHER CHECK?"(ANS ACCORDINGLY)

Upon data input completion, the final screen will appear.

"RECORD ACCEPTED..WANT TO ENTER ANOTHER? (YorN)" (ANS ACCORDINGLY)

5.4 How to DELETE PARTS TO FILE (Select Option 3).

```
======================================================
"               DELETE PARTS FROM FILE               "
======================================================
"                                                    "
"      ENTER INFORMATION BELOW:                      "
"          STOCK NUMBER TO DELETE:______             "
"                                                    "
======================================================
```

Upon entering Stock Number data, PRESS ENTER

The following appears: "FOUND" PRESS ENTER

The following appears:"SURE YOU WANT TO DELETE THIS RECORD (Y or N)"

If input is "Y" the following will appear.

"PART RECORD LOCATED AND DELETED FROM PARTS FILE"

PRESS ENTER to return to MENU.

5.5 How to EDIT PARTS TO FILE (Select Option 4).

```
====================================================
"              EDIT PART FILE RECORDS              "
====================================================
"                                                  "
"    ENTER STOCK NUMBER:____________               "
"    ENTER CORRECTED INFO BELOW (move cursor with  "
"       arrow keys, when done, place cursor on     "
"       "END".                                     "
"    NIIN:                                         "
"    NOMENCLATURE:                                 "
"    QUANTITY ON HAND:                             "
"    QUANTITY ON ORDER:                            "
"    REORDER POINT:                                "
"                                                  "
"                       END                        "
====================================================
```

This screen appears to be self-explanatory. This information will normally be given to you by the Maintenance Chief and from monthly micro-fiche received from Albany, Georgia. Stock parts and related information require monthly update and verifications.

As you can notice the information required is identical to the sample listed in section 5.12. After data input is completed PRESS ENTER.

The following will appear.

"CHANGES SAVED... CORRECT ANOTHER? (Y OR N)

If "Y" is selected you will return to the EDIT screen.

6 PHASE - CHECK

6.0 INTRODUCTION:

This section will associate SYSTEMS with a PHASE, CHECKS associated with a SYSTEM, PARTS associated with a CHECK and CHECKS associated with a PART.

6.1 I have PHASE/CHECKS on my screen, now what? (Select Option 6).

```
======================================================
"     Print PHASE/CHECK Miscellaneous Reports        "
======================================================
"                                                    "
"  Print Option:                                     "
"     1  List SYSTEMS associated with a PHASE        "
"     2  List CHECKS associated with a SYSTEM        "
"     3  List PARTS associated with a CHECK          "
"     4  List CHECKS associated with a PART          "
"     5  QUIT - Return to main menu                  "
"                                                    "
"   GIVE ME A HINT ON WHAT TO PRINT (number 1 to 4)  "
"                                                    "
======================================================
```

6.2 To print options 1 through 4.

If you select OPTIONS "1 to 4" you will receive a printout of that corresponding option selected. Ensure that your printer is ready for action.

7 REPORTS

7.0 INTRODUCTION:

7.1 Commands to use.

7.2 DAILY AIRCRAFT STATUS REPORT (Select Option 1).

```
=====================================================
"        PRINT DAILY AIRCRAFT STATUS REPORT         "
=====================================================
"                                                   "
"       THIS REPORT WILL SUMMARIZE THE MAINTENANCE  "
"   PHASE STATUS OF GROUP AIRCRAFT.                 "
"                                                   "
=====================================================
```

Enter "Y" if you desire to print. The following will appear

"Is Printer Ready? Press return to proceed.

If you only want to see the results on the screen press "N"

7.3 MAINTENANCE PART STATUS REPORT (Select Option 2).

```
=====================================================
"       PRINT MAINTENANCE PARTS STATUS REPORT       "
=====================================================
"                                                   "
"     This report will summarize phase maintenance  "
"   parts status.  You have the following options:  "
"                                                   "
"        1)  List parts with zero on - hand         "
"        2)  List parts with zero on - hand & zero  "
"              on order                             "
"        3)  List of all parts                      "
"                                                   "
"     What´s your pleasure? (number 1 to 3)         "
"                                                   "
=====================================================
```

7.4 FUTURE (10 HOUR) MAINTENANCE REPORT (Select Option 6).

```
=======================================================
"       Print TEN HOURS MAINTENANCE Report             "
=======================================================
"                                                     "
"       This report will summarize the aircraft       "
"       scheduled for induction into maintenance      "
"       with in the next ten flight hours.  It also   "
"       will list required phase related parts not    "
"       currently on - hand.                          "
"                                                     "
"       Do you desire a hard copy print-out? (Y or N) "
"                                                     "
=======================================================
```

APPENDIX C

DATABASE III PROJECT

```
*****************************************************************
*
* PROGRAM MODULE:   MAG69.PRG
* WRITTEN BY  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP:Main system menu.  Provides opening screen and menu
*           for transfer to program functions
*   INPUT/OUTPUT FILES USED:  None
*OTHER MODULES CALL:AIRSTAT.PRG, PARTSTAT.PRG, AIRCRAFT.PRG
*          PHASE.PRG, PARTS.PRG, TENHOUR.PRG, MISCRPTS.PRG,
*
*   CALLED BY:  None.
*
*   LOCAL VARIABLES:  CHOICE, RESPONSE.
*
****************************************************************
set talk off
set echo off
set bell off
set color to 6
store 0 to CHOICE
store " " to RESPONSE
clear
*************  OPENING MENU
text


  ========================================================
  ||                                                    ||
  ||                                                    ||
  ||                                                    ||
  ||                 MARINE AIR GROUP 69                ||
  ||                                                    ||
  ||        AIRCRAFT PHASE MAINTENANCE TRACKING SYSTEM  ||
  ||                                                    ||
  ||                                                    ||
  ||                                                    ||
  ||                          Press any key to begin    ||
  ========================================================
endtext
@19,54 get RESPONSE picture "X"
read
do while CHOICE <10
   close database
   clear
******  OPT MENU - SOLICIT USER FOR OPTION, EXEC WHILE W/IN
******  PARAMATERS
   text
  ========================================================
  ||                        MAIN MENU                      ||
  ========================================================
  ||                                                       ||
  ||    OPTIONS:                                           ||
  ||                                                       ||
  ||      Print Reports:            File Maintenance:      ||
  ||                                                       ||
  ||    1  Daily Aircraft Status     3  Aircraft Status    ||
  ||                                                       ||
  ||    2  Maintenance Part Status   4  Maintenance Phase  ||
  ||                                                       ||
  ||    6  10 Hour Maintenance       5  Maintenance Part   ||
  ||                                                       ||
  ||    7  PHASE/CHECK Listings                            ||
  ||                                                       ||
  ||                9  QUIT - Return to dBASE prompt       ||
  ||                                                       ||
  ||                 WHICH OPTION?  (number 1 to 9) :      ||
  ||                                                       ||
  ========================================================
  endtext
  @19,60 get CHOICE picture "#"
  read
  if CHOICE > 9
     loop
  endif
********** BRANCH TO PROG/EXECUTE CHOICE INDICATED BY USER
 do case
     case CHOICE = 1
       do AIRSTAT
     case CHOICE = 2
       do PARTSTAT
     case CHOICE = 3
       do AIRCRAFT
     case CHOICE = 4
       do PHASE
     case CHOICE = 5
       do PARTS
     case CHOICE = 6
       do TENHOUR
  case CHOICE = 7
```

```
       do MISCRPTS
     case CHOICE = 9
       return
   endcase
   store 0 to CHOICE
enddo
return

***********************************************************
*
* PROGRAM MODULE:  AIRSTAT.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURPOSE:  Creates a report that provides a/c status info.
*          Info include a/cr, what phase a/c is in and when
*          it´s due for the next phase.
*  INPUT/OUTPUT FILES USED:  AIRCRAFT.DBF.
*  OTHER MODULES CALLED:  NONE.
*  CALLED BY:  MAG69.PRG
*  LOCAL VARIABLES:  RESPONSE, HRSNXT, CHOICE.
*
*
***********************************************************
set talk off
set echo off
set bell off
clear
use aircraft
goto top
****** DRAW INPUT SCREEN - SOLICIT USER FOR HARDCOPY OUTPUT
do while .T.
   store " " to RESPONSE
   store 0 to HRSNXT
   text

  ========================================================
  ||          Print DAILY AIRCRAFT STATUS Report          ||
  ========================================================
  ||                                                      ||
  ||                                                      ||
  ||      This report will summarize the maintenance      ||
  ||      phase status of group aircraft.                 ||
  ||                                                      ||
  ||      Do you desire a hard copy printout?  (Y or N)   ||
  ||                                                      ||
  ||                                                      ||
  ||                                                      ||
  ||                                                      ||
  ========================================================

   endtext
   @10,65 get RESPONSE picture "!"
```

```
 read
  if RESPONSE = "Y"
      store " " to RESPONSE
      @10,17 say "Is printer ready? Press RET to proceed.  "
      @10,65 get RESPONSE picture "#"
      read
clear
      set print on
   else
      clear
   endif
***************** PRINT REPORT
   ?
   ?
   ?space(30)+"MARINE AIR GROUP 69"
   ?space(20)+"Aircraft Phased Maintenance Status Report"
   ?space(35)+dtoc(date())
   ?
   ?
   ?
   ?space(15)+" Acft BUNO   Current Phase  Hrs Next Phase "
   ?space(15)+" ---------   -------------  ---------------"
   ?
   do while .not. EOF()
      HRSNXT=HRSNP-TOTHRS
      if HRSNXT < 0
         HRSNXT = 0
      endif
      ?space(17)+BUNO+"(17)"+CPHASE+"(17)"+STR(HRSNXT,3,0)
      skip
      loop
   enddo
   set print off
   ?
   ?space(27)+"Press any key to continue"
   wait " " to CHOICE
   close database
   return
enddo

*****************************************************************
*  PROGRAM MODULE:  PARTSTAT.PRG
*  WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
*  PURP:  Creates a rept that prov status on parts req for
*         use with phased maint. Info included the stock no.
*      nomenclature, quantity on hand and quantity on order.
*  INPUT/OUTPUT FILES USED:  PARTS.DBF.
*  OTHER MODULES CALLED:  NONE.
*  CALLED BY:  MAG69.PRG
*  LOCAL VARIABLES:  RESPONSE, ANSWER, CHOICE.
****************************************************************
```

```
set talk off
set echo off
set bell off
clear
use parts
goto top
***** DRAW INPUT SCREEN, SOLICIT USER FOR DESIRED OPTIONS &
*             HARDCOPY OUTPUT

do while .T.
   store 0 to RESPONSE
   store " " to ANSWER
   text

  =========================================================
  ||        Print MAINTENANCE PARTS STATUS Report         ||
  =========================================================
  ||                                                      ||
  ||                                                      ||
  ||      This report will summarize phase maintenance    ||
  ||      parts status.  You have the following options:  ||
  ||                                                      ||
  ||        1) List parts with zero on-hand               ||
  ||                                                      ||
  ||        2) List parts with zero o/h & zero on order   ||
  ||                                                      ||
  ||        3) List of all parts                          ||
  ||                                                      ||
  ||      What´s your pleasure? (number 1 to 3)           ||
  ||                                                      ||
  =========================================================

   endtext
   @18,58 get RESPONSE picture "#"
   read
   if response >3
      loop
   endif
   @20,17 say "Do you desire a hard copy printout?(YorN)"
   @20,65 get ANSWER picture "!"
   read
   if ANSWER = "Y"
      store " " to ANSWER
      @20,17 say "Is printer ready? Press RET to proceed."
      @20,65 get ANSWER picture "#"
      read
      set print on
   endif
**************** PRINT REPORT
   clear
   ?
   ?
   ?space(30)+"MARINE AIR GROUP 69"
   ?space(21)+"Phased Maintenance Parts Status Report"
   ?space(35)+dtoc(date())
   ?
   ?
   ?
   ?space(15)+" NIIN     Nomenclature               OH OO "
   ?space(15)+" -----  ---------------------------  -- -- "
   ?
   do case
********* ALL PARTS WITH ZERO ON HAND
     case RESPONSE = 1
       do while .not. EOF()
          if QTYOH=0
?space(15)+NIIN+"  "+NOMEN+"  "+STR(QTYOH,3,0)+"  "+
STR(QTOO,3,0)
          endif
          skip
          loop
       enddo
*********  ALL PARTS WITH ZERO ON/ZERO DUE
     case RESPONSE = 2
       do while .not. EOF()
          if QTYOH=0 .and. QTYOO=0
?space(15)+NIIN+"  "+NOMEN+"  "+STR(QTOH,3,0)+"  "+
STR(QTOO,3,0)
          endif
          skip
          loop
       enddo
*********  ALL PARTS
     case RESPONSE = 3
       do while .not. EOF()
?space(15)+NIIN+"  "+NOMEN+" "+STR(QTOH,3,0)+"  "+
STR(QTOO,3,0)
          endif
          skip
          loop
       enddo
   endcase
   set print off
   ?
   ?space(27)+"Press any key to continue"
   wait " " to CHOICE
   close database
   return
enddo
```

```
***********************************************************
*
* PROGRAM MODULE:  AIRCRAFT.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: A/C File Sub-Menu. Provides opening screen and menu
*          for transfer to aircraft file program functions.
* INPUT/OUTPUT FILES USED:  None.
* OTHER MODULES CALLED:  AIRHOURS.PRG, AIRMAINT.PRG,
*     AIRADD.PRG, AIRDELET.PRG, AIREDIT.PRG.
* CALLED BY:  MAG69.PRG.
* LOCAL VARIABLES:  CHOICE.
*
***********************************************************
set talk off
set echo off
set bell off
store 0 to CHOICE
********** DRAW INPUT SCREEN - SOLICIT USER FOR OPTION
do while CHOICE <10
  clear
  text

  =======================================================
  ||                AIRCRAFT FILE SUB-MENU               ||
  =======================================================
  ||                                                     ||
  ||         OPTIONS:                                    ||
  ||                                                     ||
  ||                1  UPDATE FLIGHT HOURS               ||
  ||                                                     ||
  ||                2  PLACE ACFT IN/OUT OF MAINTENANCE  ||
  ||                                                     ||
  ||                3  ADD AIRCRAFT                      ||
  ||                                                     ||
  ||                4  DELETE AIRCRAFT                   ||
  ||                                                     ||
  ||                5  EDIT Aircraft Record              ||
  ||                                                     ||
  ||                6  QUIT, RETURN TO MAIN MENU         ||
  ||                                                     ||
  ||         WHICH OPTION?  (number 1 to 6) :            ||
  =======================================================

  endtext
  @20,53 get CHOICE picture "#"
  read
  if CHOICE > 6
     loop
  endif
****** BRANCH TO PROGRAM/EXECUTE CHOICE INDICATED BY USER
  do case
```

```
     case CHOICE = 1
       do AIRHOURS
     case CHOICE = 2
       do AIRMAINT
     case CHOICE = 3
       do AIRADD
     case CHOICE = 4
       do AIRDELET
     case CHOICE = 5
       do AIREDIT
     case CHOICE = 6
       return
  endcase
  store 0 to CHOICE
enddo
return

***********************************************************
* PROGRAM MODULE:  AIRHOURS.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Updates flight hours for individual a/c after daily
*            flights.
* INPUT/OUTPUT FILES USED:  AIRCRAFT.DBF.
* OTHER MODULES CALLED:  None.
* CALLED BY:  AIRCRAFT.PRG.
* LOCAL VARIABLES:  ANOTHER, NUMBER, NEWHOURS,
***********************************************************
clear
set talk off
set echo off
set bell off
use aircraft
****** DRAW INPUT SCREEN - SOLICIT USER FOR AIRCRAFT INFO
do while .T.
   store " " to ANOTHER
   store "       " to NUMBER
   store "          " to NEWHOURS
   text

  =======================================================
  ||      UPDATE FLIGHT HOURS                            ||
  =======================================================
  ||                                                     ||
  ||     ENTER INFORMATION BELOW:                        ||
  ||                                                     ||
  ||          Aircraft BUNO:                             ||
  ||                                                     ||
  ||          New Total Aircraft Hours:                  ||
  ||                                                     ||
   =======================================================
   endtext
   @10,38 get NUMBER picture "!!!!!!!"
   @12,49 get NEWHOURS picture "#########"
   read
*************** LOCATE USER SELECTED RECORD AND UPDATE
   locate for BUNO=NUMBER
   if EOF()
    @15,21 say "Aircraft not in file...try again? (Y or N)"
    @15,64 get ANOTHER picture "!"
      read
      if ANOTHER="N"
         close database
         return
      endif
      store " " to ANOTHER
      goto top
      clear
      loop
   else
      replace TOTHRS with &NEWHOURS
      @15,21 say "Aircraft located......hours updated"
      @17,21 say "Do another?  (Y or N)"
      @17,50 get ANOTHER picture "!"
      read
      if ANOTHER ="Y"
         store " " to ANOTHER
         clear
         loop
      else
         close database
         return
      endif
   endif
enddo

*******************************************************************
*
* PROGRAM MODULE:  AIRMAINT.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ PIERMARINI JUNE 1986
* PURP: Used to put a/c in or out of maintenance status and
*         update files associated with maintenance phases.
* INPUT/OUTPUT FILES USED:  AIRCRAFT.DBF.
* OTHER MODULES CALLED:  None.
* CALLED BY:  AIRCRAFT.PRG.
* LOCAL VARIABLES: ANOTHER, RESPONSE, ANSWER, FLAGCLEAR,
*    FLAGSET, NUMBER, NEWLAST, NEWCURNT, NEWHRLST, NEWHRNXT
*
*******************************************************************
set talk off
set echo off
set bell off
```

```
clear
use aircraft
goto top
****** DRAW INPUT SCREEN - SOLICIT USER FOR AIRCRAFT INFO
do while .T.
   store " " to ANOTHER
   store " " to RESPONSE
   store 0 to ANSWER
   store " " to FLAGCLEAR
   store " " to FLAGSET
   store "       " to NUMBER
   store "          " to NEWLAST
   store "          " to NEWCURNT
   store "          " to NEWHRLST
   store "          " to NEWHRNXT
   text

  ==========================================================
  ||            PUT AIRCRAFT IN/OUT OF MAINTENANCE          ||
  ==========================================================
  ||                                                        ||
  ||       ENTER INFORMATION BELOW:                         ||
  ||                                                        ||
  ||         Aircraft BUNO:                                 ||
  ||                                                        ||
  ||         Current Phase:                                 ||
  ||                                                        ||
  ||       CHANGE MAINTENANCE PHASE OF THIS ACFT? (Y or N)||
  ||                                                        ||
  ==========================================================

   endtext
   @8,36 get NUMBER picture "!!!!!!!"
   read
************ LOCATE USER SELECTED RECORD AND UPDATE
   locate for BUNO=NUMBER
   if EOF()
    @20,19 say "Aircraft not in file..try again?  (YorN)"
    @20,64 get ANOTHER picture "!"
      read
      if ANOTHER="N"
         close database
         return
      endif
      store " " to ANOTHER
      goto top
      clear
      loop
   else
      @10,36 get CPHASE
      clear get
    @12,67 get RESPONSE picture "!"
    read
    if RESPONSE = "N"
       close database
       return
    endif
    do while .T.
@12,17 say "Put air/c IN or OUT of maint.? (IN=1,OUT=2)"
@12,70 get ANSWER picture "#"
       read
       if ANSWER <1 .or. ANSWER > 2
          loop
       endif
       if ANSWER=1
  @14,19 say "What PHASE are you putting aircraft in?"
  @14,61 get NEWCURNT picture "!!!!!!!!!!"
          read
          replace CPHASE with NEWCURNT
          store "2" to FLAGSET
          replace PH with &FLAGSET
          exit
       else
     @14,19 say "Next phase will be due at what hours?"
     @14,59 get NEWHRNXT picture "##########"
          read
          replace CPHASE with "NONE"
          replace HRSLP with HRSNP
          replace HRSNP with &NEWHRNXT
          store "1" to FLAGCLEAR
          replace PH with &FLAGCLEAR
          replace PA with &FLAGCLEAR
          if LPHASE = "ALPHA"
             replace LPHASE with "BRAVO"
             exit
          endif
          if LPHASE = "BRAVO"
             replace LPHASE with "CHARLIE"
             exit
          endif
          if LPHASE = "CHARLIE"
             replace LPHASE with "DELTA"
             exit
          endif
          if LPHASE = "DELTA"
             replace LPHASE with "ALPHA"
             exit
          endif
       endif
  enddo
 endif
 @16,19 say "Phase infomation updated"
```

```
   @18,19 say "Do Another? (Y or N)"
   @18,50 get ANOTHER picture "!"
   read
   if ANOTHER = "Y"
      goto top
      clear
      loop
   else
      close database
      return
   endif
enddo

***********************************************************
*  PROGRAM MODULE:  AIRADD.PRG
*  WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 86
*  PURPOSE:  Used to add aircraft to aircraft file.
*  INPUT/OUTPUT FILES USED:  AIRCRAFT.DBF
*  OTHER MODULES CALLED:  None.
*  CALLED BY:  AIRCRAFT.PRG.
*  LOCAL VARIABLES:  ANOTHER.
***********************************************************
* program airadd.prg
clear
set talk off
set echo off
set bell off
use aircraft
store " " to ANOTHER
****** DRAW INPUT SCREEN - SOLICIT USER FOR AIRCRAFT INFO
do while .T.
append blank
text

  ========================================================
  ||                   ADD AIRCRAFT TO FILE              |
  ========================================================
  || ENTER INFORMATION BELOW:                            ||
  ||                                                     ||
  ||      Aircraft BUNO :                                ||
  ||                                                     ||
  ||      Last Phase (i.e ALPHA) :                       ||
  ||                                                     ||
  ||      Current Phase :                                ||
  ||                                                     ||
  ||      Hours Last Phase :                             ||
  ||                                                     ||
  ||      Hours Next Phase :                             ||
  ||                                                     ||
  ||      Total Aircraft Hours :                         ||
  ========================================================
   endtext
   @8,32 get BUNO
   @10,41 get LPHASE picture "!!!!!!!!!!"
   @12,33 get CPHASE picture "!!!!!!!!!!"
   @14,36 get HRSLP picture "##########"
   @16,36 get HRSNP picture "##########"
   @18,39 get TOTHRS picture "##########"
   read
   @24,10 say "Record accepted..want enter another? (YorN)"
   @24,64 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      store " " to ANOTHER
      clear
      loop
   else
      close database
      return
   endif
enddo

*****************************************************************
* PROGRAM MODULE:  AIRDELET.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURPOSE:  Used to delete aircraft from aircraft file.
* INPUT/OUTPUT FILES USED:  AIRCRAFT.DBF.
* OTHER MODULES CALLED:  None.
* CALLED BY:  AIRCRAFT.PRG.
* LOCAL VARIABLES:  ANOTHER, NUMBER, IMSURE
*****************************************************************
clear
set talk off
set echo off
set bell off
use aircraft
*****  DRAW INPUT SCREEN - SOLICIT USER FOR AIRCRAFT INFO
do while .T.
   store " " to ANOTHER
   store "       " to NUMBER
   store " " to IMSURE

   text

  ======================================================
  ||              DELETE AIRCRAFT FROM FILE             ||
  ======================================================
  ||                                                    ||
  ||      ENTER INFORMATION BELOW:                      ||
  ||                                                    ||
  ||           Aircraft BUNO :                          ||
  =======================================================
   endtext
   @9,39 get NUMBER picture "!!!!!!!"
   read
   locate for BUNO=NUMBER
   if EOF()
      @15,22 say "Aircraft not in file...try again?  (Y or N)"
      @15,64 get ANOTHER picture "!"
      read
      if ANOTHER="N"
         close database
         return
      endif
      store " " to ANOTHER
      goto top
      clear
      loop
   else
      @13,22 say "Sure you want to do this?"
      @13,50 get IMSURE picture "!"
      read
      if IMSURE="Y"
         delete
         pack
         @15,21 say "Aircraft located & deleted from file"
         @17,21 say "Do another? (Y or N)"
         @17,50 get ANOTHER picture "!"
         read
         if ANOTHER="Y"
            store " " to ANOTHER
            clear
            loop
         else
            close database
            return
         endif
      else
         close database
         return
      endif
   endif
enddo

*************************************************************
* PROGRAM MODULE:  AIREDIT.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Used to edit aircraft information in aircraft file.
* INPUT/OUTPUT FILES USED:  AIRCRAFT.DBF.
* OTHER MODULES CALLED:  None.
* CALLED BY:  AIRCRAFT.PRG.
* LOCAL VARIABLES:  ANOTHER, NUMBER
*************************************************************
```

```
  clear
  set talk off
  set echo off
  set bell off
  use aircraft
  ***** DRAW INPUT SCREEN - SOLICIT USER FOR CORRECTED DATA
  store " " to ANOTHER
  store "       " to NUMBER
  text

    =======================================================
    ||             EDIT AIRCRAFT FILE RECORD               ||
    =======================================================
    ||                                                     ||
    || ENTER Aircraft BUNO:                                ||
    ||                                                     ||
    || ENTER Corrected Info(move cursor with arrow keys):  ||
    ||          (When done, place cursor on "END")         ||
    ||                                                     ||
    ||     Last Phase :                                    ||
    ||                                                     ||
    ||     Current Phase :                                 ||
    ||                                                     ||
    ||     Hours Last Phase :                              ||
    ||                                                     ||
    ||     Hours Next Phase :                              ||
    ||     Total Aircraft Hours :                          ||
    ||                                                     ||
    ||                               END                   ||
    ||                                                     ||
    =======================================================

     endtext
     @6,33 get NUMBER picture "!!!!!!!"
     read
     locate for BUNO=NUMBER
     if EOF()
      @21,20 say "Aircraft not in file...try again? (YorN)"
      @21,64 get ANOTHER picture "!"
        read
        if ANOTHER="N"
           close database
           return
        endif
        store " " to ANOTHER
        goto top
        clear
endif   loop
     @11,30 get LPHASE picture "!!!!!!!!!!"
     @13,33 get CPHASE picture "!!!!!!!!!!"
```

```
   @15,36 get HRSLP picture "##########"
   @17,36 get HRSNP picture "##########"
   @19,39 get TOTHRS picture "##########"
   read
   @21,10 say "Changes Saved... correct another? (YorN)"
   @21,64 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      store " " to ANOTHER
      clear
      loop
   else
      close database
      return
   endif
enddo


* program phase.prg
set talk off
set echo off
set bell off
store 0 to CHOICE
do while CHOICE <10
  clear
  text
    ========================================================
  ||                  PHASE FILE SUB-MENU                 ||
  ========================================================
  ||                                                      ||
  ||          OPTIONS:                                    ||
  ||                                                      ||
  ||                 1  ADD Phases/Checks                 ||
  ||                                                      ||
  ||                 2  DELETE Phases/Checks              ||
  ||                                                      ||
  ||                 3  EDIT Phase Info                   ||
  ||                                                      ||
  ||                 4  QUIT, Return to Main Menu         ||
  ||                                                      ||
  ||                                                      ||
  ||                                                      ||
  ||          WHICH OPTION?  (number 1 to 4) :            ||
  ||                                                      ||
  ||                                                      ||
  ========================================================
  endtext
  @18,53 get CHOICE picture "#"
  read
  if CHOICE > 4
```

```
     loop
  endif
  do case
     case CHOICE = 1
       do PHASEADD
     case CHOICE = 2
       do PHASEDEL
     case CHOICE = 3
       do PHASEDIT
     case CHOICE = 4
       return
  endcase
  store 0 to CHOICE
enddo
return

***********************************************************
* PROGRAM MODULE:  PHASEADD.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURPOSE:  Adds phases and checks to the Phase/check files.
* IN/OUTPUT FILES USED: CHECKS.DBF, CHECKSI.NDX, PHASES.DBF
*                            PHASESI.NDX
* OTHER MODULES CALLED:  None.
* CALLED BY:  PHASE.PRG.
* LOCAL VARIABLES:  ANOTHER, RESPONSE, APHASE, SYSDISP.
************************************************************
clear
set talk off
set echo off
set bell off
select B
use checks index checksi
select A
use phases index phasesi
store " " to ANOTHER
store " " to RESPONSE
*** DRAW INPUT SCREEN - SOLICIT USER FOR PHASE/CHECK INFO
do while .T.
store "          " to APHASE
store "                              " to SYSDISP
text
  =======================================================
  ||                  ADD PHASES/CHECKS TO FILE         ||
  =======================================================
  ||       ENTER INFORMATION BELOW:                     ||
  ||            Maintenance Phase (i.e. ALPHA) :        ||
  ||                                                    ||
  ||            System :                                ||
  ||                                                    ||
  ||                                                    ||
  =======================================================
   endtext
   @10,54 get APHASE picture "!!!!!!!!!!"
   @12,30 get SYSDISP picture "!!!!!!!!!!!!!!!!!!!!!!"
   read
*********  SEARCH FILE FOR ALREADY THERE - ENTER IF NOT
   locate for TYPE=APHASE .AND. SYSTEM=SYSDISP
   if EOF()
 @16,11 say "Phase not in file...press RETURN to enter it"
 @16,65 get RESPONSE picture "!"
      read
      @16,11 say "
      append blank
      @7,15 say "ENTER NEW PHASE INFORMATION BELOW:"
      @10,54 get TYPE picture "!!!!!!!!!!"
      @12,30 get SYSTEM picture "!!!!!!!!!!!!!!!!!!!!"
      read
   else
  @10,54 get TYPE
  @12,30 get SYSTEM
      clear get
  @16,11 say "Phase  in file....want add checks? (Y or N)"
  @16,65 get ANOTHER picture "!"
      read
      if ANOTHER <> "Y"
         close database
         return
      endif
   endif
************** ADD ASSOCIATED CHECKS TO FILE
   select B
   store 1 to COUNTER
   do while .T.
      store " " to ANOTHER
      append blank
      @14,8 say "                                         "
      @16,8 say "                                         "
      @18,8 say "                                         "
      @16,20 say "Check: " get CHECK picture "!!!!!!!!!!!!"
      @18,20 say "Check No: " get CHECKNO picture "!!!!"
      read
      replace SYSTEM with A->SYSTEM
      @20,20 say "Enter another check? (Y or N)"
      @20,55 get ANOTHER picture "!"
      read
      if ANOTHER="Y"
         store " " to ANOTHER
          @20,8 say "
         loop
      else
         exit
      endif
  enddo
   store " " to ANOTHER
   select A
   @20,11 say "Records accepted..want to enter more?(YorN)"
   @20,64 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      store " " to ANOTHER
      clear
      loop
   else
      close database
      return
   endif
enddo

***********************************************************
* PROGRAM MODULE:  PHASEDEL.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Delete phase and checks from the Phase/Checks files.
* IN/OUTPUT FILES USED:  CHECKS.DBF, CHECKSI.NDX, PHASES.DBF
*                         PHASESI.NDX.
* OTHER MODULES CALLED:  None.
* CALLED BY:  PHASE.PRG.
* LOCAL VARIABLES: ANOTHER, WHICHONE, CORRECT, IMSURE,
*   RESPONSE.
***********************************************************
clear
set talk off
set echo off
set bell off
select B
use checks index checksi
select A
use phases index phasesi
*********** DRAW INPUT SCREEN - SOLICIT USER FOR PHASE INFO
do while .T.
   store " " to ANOTHER
   store "          " to WHICHONE
   store " " to CORRECT
   store " " to IMSURE
   store " " to RESPONSE
   text
  =========================================================
  ||              DELETE PHASES/CHECKS FROM FILE          ||
  =========================================================
  ||         ENTER INFORMATION BELOW:                     ||
  ||                                                      ||
  ||              Phase (i.e. ALPHA) :                    ||
  ||                                                      ||
  =========================================================
   endtext
   @8,44 get WHICHONE picture "!!!!!!!!!!"
   read
   goto top
******* SEARCH FILE FOR RECORD - DELETE IF THERE ELSE EXIT
   do while .not. eof()
      if TYPE=WHICHONE
         @11,15 say "Phase: " get TYPE
         @12,15 say "Maintenance Check: " get SYSTEM
         store SYSTEM to SYSTEMP
         clear get
   @14,15 say "Is this Correct Record to Delete (YorN):"
   @14,65 get CORRECT picture "!"
         read
         if CORRECT="N"
            skip
            loop
         else
   @16,15 say "Sure want to delete record (Y or N)"
   @16,65 get IMSURE picture "!"
            read
            if IMSURE="Y"
               delete
   @18,15 say "Phas/syst rec locat/delet from file"
******* DELETE ASSOCIATED CHECK FROM FILE
               select B
               goto top
               do while .not. eof()
                  if SYSTEM=SYSTEMP
                     delete
                  endif
                  skip
                  loop
               enddo
        @20,15 say "Syst/chec rec locat/delet from file"
        @22,15 say "Press any key to continue"
        @22,50 get ANOTHER picture "X"
               read
               close database
               return
            else
        @18,15 say "Not sure.I´m not eith.no chang made"
        @19,15 say "Press any key to return to sub-menu"
        @20,50 get ANOTHER picture "X"
               read
               close database
               return
            endif
         endif
      endif
      skip
   enddo
   store " " to ANOTHER
   @14,23 say "Phase not found in database "
   @16,23 say "Try again?  (Y or N)"
   @16,46 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      clear
      loop
   else
      @18,23 say "Press any key to continue"
      @18,50 get RESPONSE picture "X"
      read
      close database
      return
enddo

***********************************************************
* PROGRAM MODULE:  PHASEDIT.PRG
* WRITTEN BY:  PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURPOSE:  Used to edit phase/check info in phases file.
* INPUT/OUTPUT FILES USED: PHASES.DBF, PHASESI.NDX,
*   CHECKS.DBF, CHECKSI.NDX, PARTXREF.DBF, PXREFPRI.NDX
* OTHER MODULES CALLED:  None.
* CALLED BY:  PHASES.PRG.
* LOCAL VARIABLES: ANOTHER, RESPONSE, TEMP, WHICHONE,
*   WHICHTWO.
***********************************************************
clear
set talk off
set echo off
set bell off
select C
use partxref
select B
use checks
select A
use phases
******** DRAW INPUT SCREEN - SOLICIT USER FOR CORRECTED DATA
do while .T.
store " " to ANOTHER
store " " to RESPONSE
store "          " to WHICHONE
store "                              " to WHICHTWO
text
```

```
========================================================
||                 EDIT PHASES/CHECK RECORDS              ||
========================================================
||                                                        ||
||  ENTER Phase (i.e. ALPHA) :                            ||
||                                                        ||
||  ENTER System :                                        ||
||                                                        ||
||  ENTER Corrected Info below (move cursor with arrow    ||
||        keys):                                          ||
||                  (When done, place cursor on "END")    ||
||                                                        ||
||             Phase :                                    ||
||                                                        ||
||             System :                                   ||
||                                                        ||
||                                 END                    ||
=========================================================
   endtext
   @6,40 get WHICHONE picture "!!!!!!!!!!"
   @8,28 get WHICHTWO picture "!!!!!!!!!!!!!!!!!!!!!!!!"
   read
********* LOCATE RECORD TO CHANGE - MAKE CHANGES
   locate for TYPE=WHICHONE .and. SYSTEM=WHICHTWO
   if EOF()
    @21,12 say "Phase not in file...try again? (Y or N)"
    @21,61 get ANOTHER picture "!"
      read
      if ANOTHER="N"
         close database
         return
      endif
      store " " to ANOTHER
      goto top
      clear
      loop
   endif
   @13,26 get TYPE picture "!!!!!!!!!!"
   @15,27 get SYSTEM picture "!!!!!!!!!!!!!!!!!!!!!!!!!"
   read
   if SYSTEM<>WHICHTWO
      select B
      goto top
      do while .not. EOF()
         if SYSTEM=WHICHTWO
            replace SYSTEM with A->SYSTEM
         endif
         skip
         loop
      enddo
   endif
   @10,11 say "                                    "
   @11,11 say "                                    "
   @13,11 say "                                    "
   @15,11 say "                                    "
   @17,11 say "                                    "
   @10,11 say "Changes (if any) to Phases/Systems Made"
   @12,11 say "Want to edit associated checks? (YorN)"
   @12,55 get RESPONSE picture "!"
   read
   if RESPONSE="Y"
********** EDIT ASSOCIATED CHECKS
      select B
      goto top
      store " " to RESPONSE
      do while .not. EOF()
         if SYSTEM=A->SYSTEM
            @14,14 say "Maintenance Check : "
            @16,14 say "Check Number : "
            @ 14,35 get CHECK picture "!!!!!!!!!!!!!!!!"
            @ 16,30 get CHECKNO picture "!!!!"
            store CHECKNO to TEMP
            clear get
            @ 18,11 say "Is this the correct check?(YorN)"
            @ 18,55 get RESPONSE picture "!"
            read
            if RESPONSE<>"Y"
               skip
               loop
            endif
      @10,11 say "                                 "
      @12,11 say "                                 "
      @14,11 say "                                 "
      @16,11 say "                                 "
      @18,11 say "                                 "
      @10,11 say "ENTER Cor info belo(move w/arrow keys):"
      @11,11 say "       (When done, place cursor on END)"
      @13,14 say "Maintenance Check : "
      @15,14 say "Check Number : "
      @13,35 get CHECK
      @15,30 get CHECKNO
      @17,31 say "END"
          read
           if CHECKNO<>TEMP
               select C
               goto top
               do while .not. EOF()
                  if CHECKNO=TEMP
                     replace CHECKNO with B->CHECKNO
                  endif
                  skip
                  loop
               enddo
            endif
         endif
         exit
      enddo
   endif
  @21,10 say "Changes Saved... correct another? (YorN) "
  @21,64 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      store " " to ANOTHER
      select A
      clear
      loop
   else
      close database
      return
   endif
enddo

***********************************************************
* PROGRAM MODULE: PARTS.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Parts File sub-menu, transfer to part file prog
* OTHER MODULES CALL: PARTSWAP.PRG, PARTSADD.PRG,
*   PARTSDEL.PRG, PARTEDIT.PRG
* CALLED BY:  MAG69.PRG
* LOCAL VARIABLES:  CHOICE.
*
************************************************************
set talk off
set echo off
store 0 to CHOICE
********** DRAW INPUT SCREEN - SOLICIT USER FOR OPTIONS
do while CHOICE <10
  clear
  text
  =========================================================
  ||                 PARTS FILE SUB-MENU                    ||
  =========================================================
  ||         OPTIONS:                                       ||
  ||                1  RECEIVE, ISSUE, ORDER Parts          ||
  ||                2  ADD Parts                            ||
  ||                3  DELETE PARTS                         ||
  ||                4  EDIT Part Info                       ||
  ||                5  QUIT, Return to Main Menu            ||
  ||                                                        ||
  ||         WHICH OPTION?  (number 1 to 5) :               ||
  =========================================================
  endtext
  @19,53 get CHOICE picture "#"
  read
  if CHOICE > 5
     loop
  endif
******* BRANCH TO PROGRAM/EXECUTE CHOICE INDICATED BY USER
  do case
     case CHOICE = 1
       do PARTSWAP
     case CHOICE = 2
       do PARTSADD
     case CHOICE = 3
       do PARTSDEL
     case CHOICE = 4
       do PARTEDIT
     case CHOICE = 5
       return
  endcase
  store 0 to CHOICE
enddo
return

**********************************************************
* PROGRAM MODULE:  PARTSWAP.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURPOSE:  Used to update parts file for parts ordered,
*              issued and  received.
* INPUT/OUTPUT FILES USED:  PARTS.DBF.
* OTHER MODULES CALLED:  NONE.
* CALLED BY:  PARTS.PRG
* LOCAL VARIABLES:  ANOTHER, STOCKNO, CHOICE, CHANGE.
**********************************************************
clear
set talk off
set echo off
set bell off
use parts
*** INITIATE VARIABLES, DRAW INPUT SCREN-SOLICIT USER INFO
do while .T.
   store " " to ANOTHER
   store "           " to STOCKNO
   store 0 to CHOICE
   store 0 to CHANGE
   text
  ========================================================
  ||              ORDER, RECEIVE, ISSUE PARTS              ||
  ========================================================
  ||                                                       ||
  ||  ENTER INFORMATION BELOW:                             ||
  ||                                                       ||
  ||          Part Stock Number :                          ||
  ||                                                       ||
  ========================================================

   endtext
   @10,42 get STOCKNO picture "###########"
   read
*********** FIND DESIRED STOCKNO - UPDATE INFO
   locate for NIIN=STOCKNO
   if EOF()
 @12,21 say "Stock Num not in file...try again? (Y or N) "
 @12,67 get ANOTHER picture "!"
      read
      if ANOTHER="N"
         close database
         return
      endif
      store " " to ANOTHER
      goto top
      clear
      loop
   else
   do while .T.
 @12,13 say "1)ORDER  2)RECEIVE  3)ISSUE Parts (num1to3):"
 @12,66 get CHOICE picture "#"
      read
      if CHOICE >3
         store " " to CHOICE
         loop
      endif
      exit
   enddo
      do case
********* UPDATE FOR ORDER
         case CHOICE = 1
            @14,17 say "Order Quantity :"
            @14,34 get CHANGE picture "###"
            read
            replace QTYOO with QTYOO+CHANGE
*********** UPDATE FOR RECEIPT
         case CHOICE = 2
            @14,17 say "Receipt Quantity :"
            @14,36 get CHANGE picture "###"
            read
            replace QTYOH with QTYOH+CHANGE
            replace QTYOO with QTYOO-CHANGE
******** UPDATE FOR ISSUE
         case CHOICE = 3
            @14,17 say "Issue Quantity :"
            @14,34 get CHANGE picture "###"
            read
            replace QTYOH with QTYOH-CHANGE
      endcase
  @16,17 say "Stock Number located....quantities updated"
  @18,17 say "Do another?  (Y or N)"
  @18,50 get ANOTHER picture "!"
    read
      if ANOTHER ="Y"
         store " " to ANOTHER
         clear
         loop
      else
         close database
         return
      endif
   endif
enddo

*********************************************************
* PROGRAM MODULE:  PARTSADD.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Used to add part to the parts file & update cross-
*          reference file.
* INPUT/OUTPUT FILES USED: PARTS.DBF, PARTXREF.DBF,
*      PXREFPRI.NDX,   PXREFSEC.NDX
* OTHER MODULES CALLED:  None.
* CALLED BY:  PARTS.PRG
* LOCAL VARIABLES:  ANOTHER, STOCKNO.
*********************************************************
clear
set talk off
set echo off
set bell off
select B
use partxref index pxrefpri
select A
use parts
*** INITIATE VARIABLES, DRAW INP SCREEN-SOLICIT USER INFO
do while .T.
   store " " to ANOTHER
   store "           " to STOCKNO
   text
  ========================================================
  ||                   ADD PART TO FILE                 ||
  ========================================================
  ||                                                    ||
  ||ENTER INFORMATION BELOW:                            ||
  ||                                                    ||
  ||     Part Stock Number (NIIN) :                     ||
  ||                                                    ||
  ||     Part Nomenclature :                            ||
  ||                                                    ||
  ||     Quantity on Hand :          Quantity on Order :||
  ||                                                    ||
  ||     Reorder Point :                                ||
  ||                                                    ||
  ========================================================

   endtext
   @8,45 get STOCKNO picture "###########"
   read
********* LOCATE TARGET RECORD & MODIFY
   locate for NIIN=STOCKNO
   if EOF()
      append blank
      @8,45 get NIIN picture "###########"
      @10,38 get NOMEN picture "!!!!!!!!!!!!!!!!!!!!!!!!"
      @12,37 get QTYOH picture "###"
      @12,65 get QTYOO picture "###"
      @14,34 get ROP picture "###"
      read
   else
    @10,14 say "                                      "
    @12,14 say "                                      "
    @14,14 say "                                      "
    @10,16 say "This part already in file"
    @12,16 say "If this part part assoc with other checks"
    @13,16 say "you may enter those chks now. Do it?(YorN)"
    @13,67 get ANOTHER picture "!"
     read
      if ANOTHER<>"Y"
          close database
          return
      endif
   endif
   select B
********* ADDING CHECKS TO CROSS REFERENCE FILE
   do while .T.
      append blank
 @16,12 say "This part assoc w/ what check? (i.e. A309) : "
 @16,65 get CHECKNO picture "!!!!"
      read
      replace XNIIN with A->NIIN
 @18,12 say "This part associated with another check? : "
 @18,56 get ANOTHER picture "!"
      read
      if ANOTHER="Y"
     store " " to ANOTHER
  @18,12 say "                                           "
      loop
      else
         store " " to ANOTHER
 @20,12 say "Rec accept...want to enter another? (YorN) "
 @20,66 get ANOTHER picture "!"
         read
         if ANOTHER="Y"
            store " " to ANOTHER
            clear
         else
      @22,12 say "Reindexing secondary key file..ple wait"
      set index to pxrefsec
      reindex
      close database
      return
         endif
      endif
      exit
   enddo
   select A
   goto top
   loop
enddo

**********************************************************
* PROGRAM MODULE:  PARTSDEL.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
*  PURP: Used to delete a part from the parts file & update
*          cross reference file.
*  IN/OUTPUT FILES USED: PARTS.DBF, PARTXREF.DBF,
*     PXREFPRI.NDX, PXREFSEC.NDX
*  OTHER MODULES CALLED:  None.
*  CALLED BY:  PARTS.PRG
*  LOCAL VARIABLES:  ANOTHER, WHICHONE, RESPONSE, IMSURE
**********************************************************
clear
set talk off
set echo off
set bell off
select B
use partxref index pxrefpri
select A
use parts
** INITIATE VARIABLES, DRAW INPUT SCREEN-SOLICIT USER INFO
do while .T.
```

```
   store " " to ANOTHER
   store "           " to WHICHONE
   store " " to RESPONSE
   store " " to IMSURE
   text

  =======================================================
  ||                DELETE PARTS FROM FILE             ||
  =======================================================
  ||                                                   ||
  ||                                                   ||
  ||       ENTER INFORMATION BELOW:                    ||
  ||                                                   ||
  ||          Stock Number to delete :                 ||
  ||                                                   ||
  ||                                                   ||
  ||                                                   ||
  ||                                                   ||
  ||                                                   ||
  ||                                                   ||
  =======================================================

   endtext
   @9,46 get WHICHONE picture "###########"
   read
   goto top
********** LOCATE DESIRED RECORD - DELETE FROM FILE
   do while .not. eof()
      if NIIN=WHICHONE
         @12,20 say "Stock Number : " get NIIN
         @12,47 say " Found "
         store NIIN to TEMPNIIN
         clear get
   @14,20 say "Sure want to delete this record (Y or N)"
   @14,67 get IMSURE picture "!"
         read
         if IMSURE="Y"
            delete
      @16,20 say "Part rec locat & delet from Parts File"
            select B
            goto top
            do while .not. eof()
               if XNIIN=A->NIIN
                  delete
               endif
               skip
               loop
            enddo
      @18,20 say "Part rec locat & delet from Xrefer File"
      @20,20 say "Wait....reindexing secondary key index"
            set index to pxrefsec
            reindex
            close database
            return
         else
       @16,20 say "Not sure.I´m not either.no changes made"
       @18,20 say "Press any key to return to sub-menu"
            @18,57 get ANOTHER picture "X"
            read
            close database
            return
         endif
      endif
      skip
   enddo
   store " " to ANOTHER
   @12,20 say "Part not found in database "
   @14,20 say "Try again?  (Y or N) :"
   @14,46 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      clear
      loop
   else
      @16,20 say "Press any key to continue "
      @16,50 get RESPONSE picture "X"
      read
      close database
      return
enddo

***********************************************************
*
* PROGRAM MODULE:  PARTEDIT.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Used to edit part in the parts file & update cross
*           reference file.
*  IN/OUTPUT FILES USED:  PARTS.DBF, PARTXREF.DBF,
*    PXREFPRI.NDX,  PXREFSEC.NDX
*  OTHER MODULES CALLED:  None.
*  CALLED BY:  PARTS.DBF.
*  LOCAL VARIABLES:  ANOTHER, RESPONSE, STOCKNO.
*
**********************************************************
clear
set talk off
set echo off
set bell off
select B
use partxref index pxrefpri
select A
use parts
```

```
** INITIATE VARIABLES, DRAW INPUT SCREEN-SOLICIT USER INFO
do while .T.
store " " to ANOTHER
store " " to RESPONSE
store "           " to STOCKNO
text
  =====================================================
  ||                 EDIT PART FILE RECORDS            ||
  =====================================================
  || ENTER Stock Number:                               ||
  ||                                                   ||
  || ENTER Corrected Info Below(move cursor with       ||
  ||    arrow keys):                                   ||
  ||                 (When done, place cursor on "END")||
  ||            NIIN :                                 ||
  ||                                                   ||
  ||            Nomenclature :                         ||
  ||                                                   ||
  ||            Quantity on hand :                     ||
  ||                                                   ||
  ||            Quantity on order :                    ||
  ||                                                   ||
  ||            Reorder point :                        ||
  ||                                 END               ||
  =====================================================
   endtext
   @6,33 get STOCKNO picture "###########"
   read
******** LOCATE DESIRED RECORD - EDIT
   locate for NIIN=STOCKNO
   if EOF()
@21,12 say "Stock NO. not in file...try again? (Y or N)"
@21,59 get ANOTHER picture "!"
     read
      if ANOTHER="N"
         close database
         return
      endif
      store " " to ANOTHER
      goto top
      clear
      loop
   endif
   @11,24 get NIIN picture "###########"
   @13,32 get NOMEN picture "!!!!!!!!!!!!!!!!!!!!!!!!!!!"
   @15,36 get QTYOH picture "###"
   @17,37 get QTYOO picture "###"
   @19,34 get ROP picture #"
   read
   if NIIN<>STOCKNO
********** UPDATE CROSS REFRENCE FILE
```

```
      select B
      goto top
      do while .not. EOF()
         if XNIIN=STOCKNO
            replace XNIIN with A->NIIN
         endif
         skip
         loop
      enddo
   endif
@21,10 say "Changes Saved... correct another? (YorN)"
@21,64 get ANOTHER picture "!"
   read
   if ANOTHER="Y"
      store " " to ANOTHER
      select A
      clear
      loop
   else
 @22,10 say "Please wait...reindexing secondary key file"
 select B
 set index to pxrefsec
 reindex
 close database
 return
   endif
enddo

**********************************************************
*
* PROGRAM MODULE:  TENHOUR.PRG
* WRITTEN BY PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Creates a rept & provides status on phase/parts info
*       for a/c that are to enter maintenance with the next
*          ten flight hours.
* IN/OUT FILES USED:  AIRCRAFT.DBF, PARTS.DBF, PARTXREF.DBF,
*                         PXREFPRI.NDX
* OTHER MODULES CALLED:  None.
* LOCAL VARIABLES:  RESPONSE, HRSNXT, NEXT.
*
**********************************************************
set talk off
set echo off
set bell off
clear
select A
use partxref index pxrefpri
select B
use parts
goto top
select C
```

```
use aircraft
***** DRAW INPUT SCREEN - SOLICIT USER FOR HARDCOPY OUTPUT
do while .T.
   store " " to RESPONSE
   store 0 to HRSNXT
   text

  =======================================================
  ||          Print TEN HOURS MAINTENANCE Report        ||
  =======================================================
  ||                                                    ||
  ||                                                    ||
  ||       This report  will summarize the aircraft     ||
  ||       scheduled for induction into maintenance     ||
  ||       with in the  next ten flight hours.   It     ||
  ||       also  will list  required phase  related     ||
  ||       parts not currently on-hand.                 ||
  ||                                                    ||
  ||       Do you desire a hard copy print-out?(Y or N) ||
  ||                                                    ||
  ||                                                    ||
  ||                                                    ||
  ||                                                    ||
  ======================================================

endtext
   @13,67 get RESPONSE picture "!"
   read
   if RESPONSE = "Y"
      store " " to RESPONSE
@13,15 say "Is printer ready? Press RETURN to proceed.  "
@13,67 get RESPONSE picture "#"
      read
      clear
      set print on
   else
      clear
   endif
*********** PRINT REPORT
   ?
   ?
   ?space(30)+"MARINE AIR GROUP 69"
   ?space(27)+"Ten Hour Maintenance Report"
   ?space(35)+dtoc(date())
   ?
   ?
   ?
 ?space(15)+" Acft BUNO  Current Phase    Hrs Next Phase "
 ?space(15)+" --------   -------------    ---------------"
   ?
```

```
******** DETERMINES NEXT PHASE
   do while .not. EOF()
      HRSNXT=HRSNP-TOTHRS
      do case
         case LPHASE="ALPHA"
             NEXT="B"
         case LPHASE="BRAVO"
             NEXT="C"
         case LPHASE="CHARLIE"
             NEXT="D"
         case LPHASE="DELTA"
             NEXT="A"
      endcase
*********** PRINTS AN AIRCRAFT DUE WITHIN 10 HOURS
      if HRSNXT <=10 .and. CPHASE="NONE"
?space(12)+"====> "+BUNO+"    "+CPHASE+"12"+STR(HRSNXT,3,0)
         ?
*** SEARCH FOR PARTS ASSOC WITH CHECK AND PRINTS IF NIS
     ?space(18)+"Parts Required for phase but NOT in stock:"
         ?
         select B
         goto top
         select A
         goto top
         do while .not. EOF()
            if SUBSTR(CHECKNO,1,1)=NEXT
        select B
           do while .not. EOF()
              if NIIN = A->XNIIN
                  if QTYOH=0
                   ?space(18)+NOMEN+"     "+NIIN+"     1"
                    endif
                     exit
                   else
                  skip
                 loop
                endif
               enddo
            else
               skip
               loop
            endif
            select A
            skip
            loop
         enddo
         ?
         ?
      endif
      select c
      skip
      loop
   enddo
   set print off
   ?
   ?space(27)+"Press any key to continue"
   wait " " to CHOICE
   close database
   return
enddo

**********************************************************
*
* PROGRAM MODULE:  MISCRPTS.PRG
* WRITTEN BY: PEARSON, MURPHY, ORTIZ, PIERMARINI JUNE 1986
* PURP: Prints pre-programd/format dbase queries regarding
*        phase and check information.
*  IN/OUTPUT FILES USED:  CHECKS.DBF, CHECKSI.NDX,
*   PHASES.DBF, PHASESI.NDX, PARTS.DBF, PARTXREF.DBF,
*   PXREFPRI.NDX, PXREFSEC.NDX
*  OTHER MODULES CALLED:  NONE.
*  CALLED BY:  MAG69.PRG.
*  LOCAL VARI: CHOICE, RESPONSE, WHICHPHA, WHICHSYS,
*     WHICHCHK, WHICHPART, THISONE.
*
***********************************************************
set talk off
set echo off
set bell off
select C
use parts
select B
use checks index checksi
select A
use phases index phasesi
****** INITIATE VARIABES, DRAW INPUT SCREEN-SOLICIT USER
****** OPTIONS
do while .T.
store 0 to CHOICE
store " " to RESPONSE
store "          " to WHICHPHA
store "                              " to WHICHSYS
store "    " to WHICHCHK
store "           " to WHICHPART
clear
text
```

```
  ======================================================
  ||        Print PHASE/CHECK Miscellaneous Reports     ||
  ======================================================
  ||      PRINT OPTIONS:                                ||
  ||          1  List SYSTEMS associated with a PHASE   ||
  ||                                                    ||
  ||          2  List CHECKS associated with a SYSTEM   ||
  ||                                                    ||
  ||          3  List PARTS associated with a CHECK     ||
  ||                                                    ||
  ||          4  List CHECKS associated with a PART     ||
  ||          5  QUIT - Return to main menu             ||
  || GIVE ME A HINT WHAT TO PRINT?                      ||
  =======================================================
  endtext
   @17,67 get CHOICE picture "#"
   read
   if CHOICE > 5
      loop
   endif
   if CHOICE=5
     close database
     return
   endif
 @19,19 say "Do you desire a hard copy printout?(YorN)"
 @19,66 get RESPONSE picture "!"
   read
   if RESPONSE = "Y"
      store " " to RESPONSE
 @21,19 say "Is printer ready?  Press RETURN to proceed."
 @21,66 get RESPONSE picture "#"
      read
      set print on
   endif
   do case
************ PRINT REPORTS FOR SYSTEMS ASSOC WITH PHASE
      case CHOICE = 1
      clear
      goto top
   @3,15 say " Print SYSTEMS associated with a PHASE "
   @5,15 say " Which PHASE?"
   @5,29 get WHICHPHA picture "!!!!!!!!!!"
      read
      store WHICHPHA to THISONE
      clear
    ?
    ?
    ?space(17)+"SYSTEMS associated with PHASE "+THISONE
    ?
      do while .not. EOF()
         if TYPE > THISONE
```

```
            exit
         endif
         if TYPE = THISONE
            ?space(20)+SYSTEM
         endif
         skip
         loop
      enddo
********* PRINT REPORTS FOR CHECKS ASSOCIATED WITH SYSTEM
      case CHOICE = 2
      clear
      select B
      goto top
      @3,15 say " Print CHECKS associated with a SYSTEM"
      @5,15 say " Which SYSTEM?"
      @5,31 get WHICHSYS picture "!!!!!!!!!!!!!!!!!!!!!!!"
      read
      store WHICHSYS to THISONE
      clear
      ?
      ?
      ?space(17)+"CHECKS associated with SYSTEM "+THISONE
      ?
      do while .not. EOF()
         if SYSTEM > THISONE
            exit
         endif
         if SYSTEM = THISONE
            ?space(20)+CHECK+"     "+CHECKNO
         endif
         skip
         loop
      enddo
************* PRINT REPORT FOR PARTS ASSOCIATED WITH CHECK
      case CHOICE = 3
      clear
      use partxref index pxrefsec.ndx
      goto top
      @3,15 say " Print PARTS associated with a CHECK "
      @5,15 say " Which CHECK? (number)"
      @5,38 get WHICHCHK picture "!###"
      read
      store WHICHCHK to THISONE
      clear
      ?
      ?
      ?space(17)+"PARTS associated with CHECK "+THISONE
      ?
      do while .not. EOF()
         if CHECKNO > THISONE
            exit
```

```
          endif
          if CHECKNO = THISONE
             ?space(20)+XNIIN
          endif
          skip
          loop
       enddo
********** PRINT REPORT FOR CHECKS ASSOCIATED WITH PART
       case CHOICE = 4
       clear
       use partxref index pxrefpri
       goto top
       @3,15 say " Print CHECKS associated with a PART "
       @5,15 say " Which PART (NIIN)"
       @5,39 get WHICHPART picture "###########"
       read
       store WHICHPART to THISONE
       clear
       ?
       ?
       ?space(17)+"CHECKS associated with PART "+THISONE
       ?
       do while .not. EOF()
          if XNIIN > THISONE
             exit
          endif
          if XNIIN = THISONE
             ?space(20)+CHECKNO
          endif
          skip
          loop
       enddo
    endcase
    ?
    set print off
    ?
    ?space(23)+"Press any key to continue"
    wait " " to CHOICE
    loop
enddo

select 2
use parts
select 1
use subsystems
do while .not. EOF()
   @10,20 get STOCKNO
   @11,20 get NOMENCLAT
   read
   select 2
   append blank
   replace NIIN with SUBSYSTEMS->STOCKNO
   replace NOMEN with SUBSYSTEMS->NOMENCLAT
   select 1
   skip
   loop
enddo



SELECT 2
USE PARTXREF
SELECT 1
USE SUBSYSTEMS
DO WHILE .NOT. EOF()
  @10,20 GET CHECKNO
  @10,30 GET STOCKNO
  READ
  SELECT 2
  APPEND BLANK
  REPLACE XNIIN WITH SUBSYSTEMS->STOCKNO
  REPLACE CHECKNO WITH SUBSYSTEMS->CHECKNO
  SELECT 1
  SKIP
  LOOP
ENDDO
```

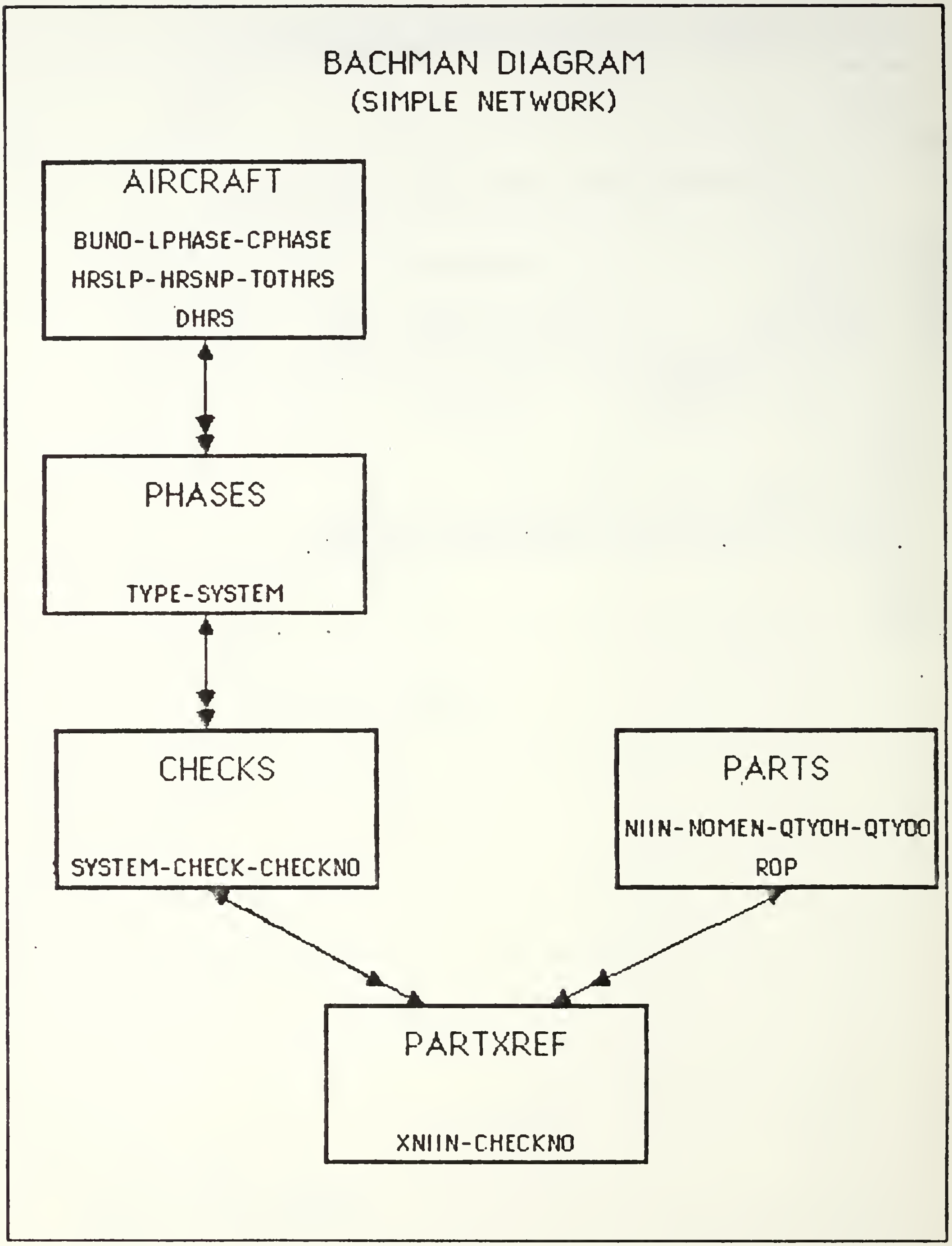
BACHMAN DIAGRAM
(SIMPLE NETWORK)
AIRCRAFT
BUNO-LPHASE-CPHASE
HRSLP-HRSNP-TOTHRS
DHRS
PHASES
TYPE-SYSTEM
CHECKS
SYSTEM-CHECK-CHECKNO
PARTS
NIIN-NOMEN-QTYOH-QTYOO
ROP
PARTXREF
XNIIN-CHECKNO

Figure C.1 Bachman Diagram

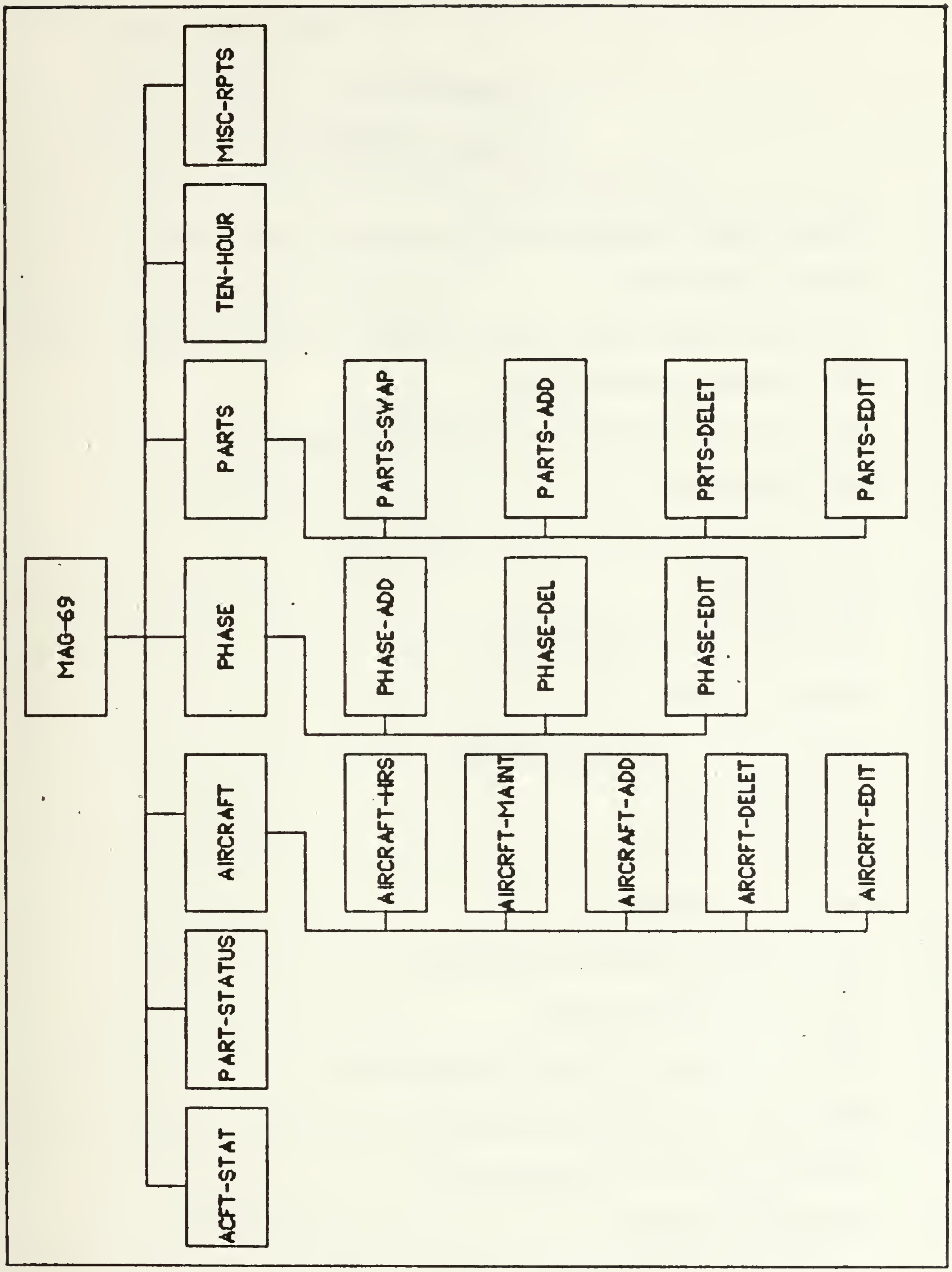
MAG-69
ACFT-STAT
PART-STATUS
AIRCRAFT
PHASE
PARTS
TEN-HOUR
MISC-RPTS
AIRCRAFT-HRS
AIRCRFT-MAINT
AIRCRAFT-ADD
ARCRFT-DELET
AIRCRFT-EDIT
PHASE-ADD
PHASE-DEL
PHASE-EDIT
PARTS-SWAP
PARTS-ADD
PRTS-DELET
PARTS-EDIT

Figure C.2 MAG69 Hierarchy Diagram

APPENDIX D

4TH MAW LAN USES

1. Part verification/status
2. Fiscal reporting
3. Unit LM-2 updating
4. PEB section coordination
5. CMR (Consolidated Memordam Reporting)
6. Tool control
7. MAL (Mechanized Allowance Listing)
8. Fuel Status
9. Mobilization coordination
10. Supply status
11. Publication updates/status
12. Correspondance
13. Fitness reports
14. Medical updating
15. Recruiting/retention updating
16. Training coordination
17. Armory access listing/verification
18. Management information access
19. Authorization correspondance
20. Operation Orders
21. Aircraft file updates
22. Vehicle/aircraft maintenance schedule access

23. Inventory reporting

24. Embarkation inventory

25. T/O and T/E (review)

26. Reserve drill reporting and attendance

27. Meeting coordination and information requirements

28. Intelligence reporting

29. Rosters (guard, alpha, recall)

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